

Coal Age

JUNE, 1957

A MCGRAW-HILL PUBLICATION—PRICE \$1

The River Queen:

Key to High Tonnage ... p84



Nuclear Power... A Challenge ... p54



NEW M-S-A[®] PERMISSIBLE MINE LIGHTING SYSTEMS PROMISE GREATER PRODUCTIVITY AND FEWER ACCIDENTS FOR MINES



Here's significant news for the mining industry: the new M-S-A Permissible Mine Lighting Systems will provide working crews with the first *safe* units for underground illumination since the electric cap lamp.

These systems provide supplementary illumination to electric cap lamps, principally in working areas, to make operation safer and more efficient. They are available in ungrounded twin wire and isolated grounded three wire circuits.

Key to the systems is the M-S-A Fluorescent Lamp Fixture. This portable unit utilizes two 14 watt fluorescent tubes and operates from 118 volts, 60 cycles. Write for descriptive bulletin.

MINE SAFETY APPLIANCES COMPANY

201 North Braddock Avenue, Pittsburgh 8, Pennsylvania

At Your Service: 76 Branch Offices in the United States



MINE SAFETY APPLIANCES CO. OF CANADA, LIMITED

Toronto, Montreal, Calgary, Edmonton,

Winnipeg, Vancouver, Sydney, N. S.

Representatives in Principal Cities in

Mexico, Central and South America

Cable Address: "MINSAP" Pittsburgh

B.F. Goodrich



Where B.F. Goodrich belt reduced maintenance costs, lasted longer too

THAT picture shows the natural trough of a B.F. Goodrich cord belt—under a light load—as it carries coal from the mine to the cars. In use 6 years when this picture was taken, the B.F. Goodrich belt had outlasted all other conveyor belts in the mine and was expected to last another 4-6 years. There's been no maintenance due to edge wear. Here's why.

A conveyor belt that doesn't trough naturally—under light as well as heavy loads—loses complete contact with idlers, runs off center, wears along the edges.

The natural trough of a B.F. Goodrich cord belt eliminates these problems. In this exclusive design, there's a ply of

parallel cords, running lengthwise, built into both the top and bottom of the belt. Each individual cord is completely surrounded by rubber—no cross threads bind them together. This makes the cord belt unusually flexible, so that it keeps centered on the idlers, and holds its cupped shape whether empty, lightly or fully loaded.

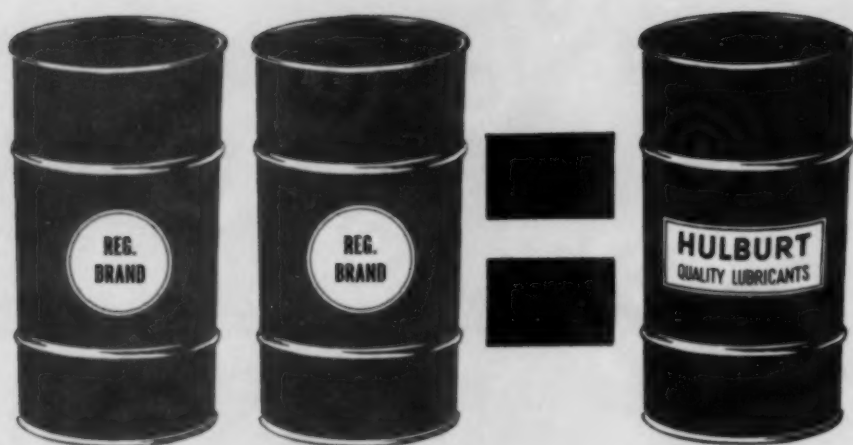
Natural troughing is just one of the reasons the B.F. Goodrich Caricoal cord belt lasts longer, reduces coal handling costs. Other construction features provide high impact resistance and double protection against mildew. And, as a safety measure, B.F. Goodrich now makes conveyor belts with a new fire-resisting rubber which will not support

combustion or spread fire.

Before you buy another conveyor belt, look into the cost-saving advantages you get with a cord belt, and the safety you can get with B.F. Goodrich fire-resisting rubber. Your B.F. Goodrich distributor can give you full details, or write B.F. Goodrich Industrial Products Co., Dept. M-969, Akron 18, O.



YES...



you do use LESS* when it's
HULBURT



FULL DRUM
55 GALS.



QUARTER DRUM



PAIL—38 lbs.



CARTRIDGE—1 lb.
IN HANDY CARRYING CARTON
10 per carton

because Hulburt Quality Lubricants stay in equipment much longer than other lubricants! Stability is the answer — Hulburt's famous "body" gives lubricants more strength to resist severe heat, agitation, water or high pressure.

AP GREASE and NO. 11 LUBRICANTS

These two stalwarts of the Hulburt line are ready to serve you. Contact your Hulburt representative today.

Hulburt

OIL and GREASE COMPANY

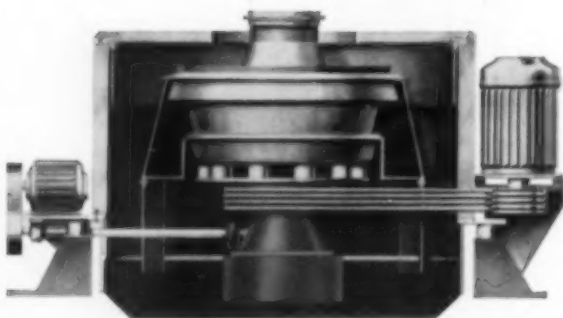
PHILADELPHIA 34, PA.

Specialists in Quality Lubricants for the Coal Mining Industry



**It costs less
—much less**

to dewater fine coal with a BIRD-HUMBOLDT Centrifugal Dryer



A unique *oscillating plus rotating* action throws out the moisture and at the same time treats the coal to a gentle shaking action as it moves up and across the screen surface of a tapered basket. The result is an evenly distributed porous layer of solids, constantly shifting position to allow moisture to escape. Screens need changing only every 4 to 6 months instead of the usual every few days.

The cost of running and maintaining the usual screen type centrifuge for dewatering fine coal is seldom less than six cents a ton and may run a good deal higher.

The Bird-Humboldt Screen Centrifugal Dryer is doing the job for *much less* — in some cases for less than one cent per ton.

Main reasons for this amazing cost difference are (1) the Bird-Humboldt takes only $\frac{1}{4}$ kwh per ton of coal delivered and (2) screen replacement cost is under $\frac{1}{2}$ cent per ton.

The Bird-Humboldt does a uniformly thorough and efficient moisture removal job. Fewer solids are found in the effluent and this applies over the entire screen life. And even with the softest coals, there is almost no degradation.

May we mail you the new Bird-Humboldt Bulletin telling the complete story?

BIRD

MACHINE COMPANY

SOUTH WALPOLE, MASSACHUSETTS

Regional Offices:

EVANSTON, ILLINOIS

PORTLAND, OREGON

This Month in

JUNE 1957

Coal Age

► Competition

Planning for Competitive Nuclear Power p 54

W. A. Raleigh, Jr., Assistant Editor, Coal Age

A more realistic adjustment to the prospect of competitive nuclear power is vital to coal because the Nation is moving toward a strengthening of its atomic power development program. No one knows the exact form that strengthening will take—and it may be a year or more before such is known. But informed expert opinion indicates that whatever the form, the result will be a firmer program dedicated to making nuclear power competitive or nearly competitive with steam power after 1970 in the upper cost range of 8 to 10 mills per kwhr. Coal's job: adopt NOW and maintain an industry-action program specifically geared to the prospect of eventual nuclear power.

Along the Way—Washington reports atomic speed-up coming; what coal must do.



► Stripping

DeBardeleben Strips 18-in Seam p 60

A new versatile overburden drill coupled with a 7-yd high-lift shovel permits Alabama operator to remove up to 50 ft of cover on thin seam. Mounted on a wide-gage tractor with a bulldozer blade, the drill cuts its own road and has a built-in water spray for suppression of drill dust. Two men drill an average of 600 ft of hole per shift and also load explosives. Rock is broken with Akremite, used in a ratio of 1 lb per 5 cu yd of overburden. The high-lift shovel works around the

clock, moving an average of 10,000 cu yd each day and has handled as much as 15,000 cu yd in 24 hr.

Sidelights—Low-cost storage bin made from scrap railroad car; treated timber makes tunnel under stockpile; low-cost barge-loading facility.

► Maintenance

38 Ways to Prevent Motor Failure . . p 64

A summary of motor-maintenance tips tells why electric motors fail and what can be done to prevent such failures. These rules can be passed along from maintenance supervisors to mine mechanics and electricians to offset the ravages of the dust, moisture and wear-and-tear to which mine motors are subjected.

Sidelights—Pithy cartoons drive the message home.

► Personnel Management

Training Topnotch Foremen p 68

Management officials at Truax-Traer's West Virginia Div. are firmly convinced that the average skilled worker within a company's own ranks can be inspired to success as a topnotch foreman. Their conviction is based on results of a new supervisory training program which couples extensive on-the-job training with classroom instruction. Initial results are pointing the way toward a supervisory force, more stabilized in quantity and quality, more keenly aware of the values of human relations in job performance, and better informed on company standards and the foreman's duties.

Featured—Mine rotation schedule for foremen trainees.

► Improving Mine Services

Dual-Purpose Borehole Serves Producing Sections p 70

A 4-in drainage line and four 2-in power-cable pipe-lines installed in a 10-in borehole 416 ft deep eliminate long-distance pumping and power transmission. Total cost: Less than \$3,500 for drilling the hole, placing the pipe and grouting from top to bottom at Crucible mine.

(Continued on page 7)

**Example of quality controls
that assure Certified Steel
from Ryerson**



Cuts 24" beams in 12 seconds!

When this big friction saw cuts cold steel like hot butter it also completes one more step in the quality control of Ryerson steel.

A new method of blade alignment and an automatic gauge of our own design assure a remarkably straight, true cut—and frequent blade changes result in minimum burr!

This kind of control is typical of the exacting attention we give to every operation. As a result, we achieve far greater accuracy than

called for in standard tolerance tables—almost without exception.

Certified cutting of Ryerson steel and the over-all control of Ryerson steel quality are important points to remember when you're specifying or buying steel from stock.



RYERSON STEEL

In stock: Carbon, alloy & stainless steel—bars, structurals, plates, sheets, tubing, industrial plastics, machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI
CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

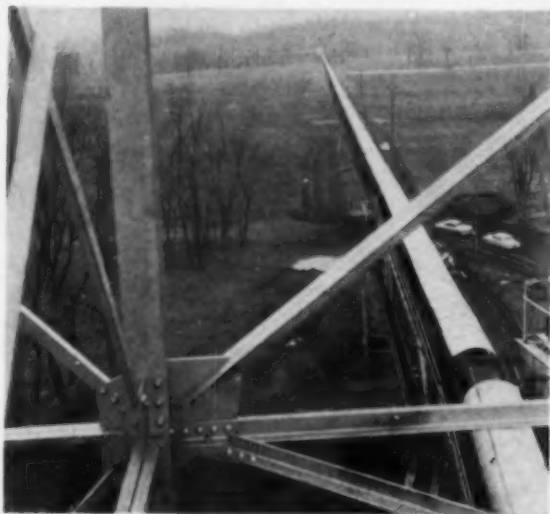


Added Crucible Feature—Automatic pump controls provide protection against operating without load.

► Deep Mining

DeKoven Mine: Efficient Producer of Industrial Fuel p 74

Pittsburg & Midway Coal Mining Co. opens its first big deep mine at Sturgis in western Kentucky to produce high-quality industrial fuel for shipment on the Ohio River. Outstanding features include:



7.2-kv, AC, power in primary distribution system underground supplies rated voltage at face;

Raw- and washed-coal stockpiles at preparation plant insure flexibility;

2½ mi of overland belt conveyor transports coal from mine to plant and from plant to river;

River pier handles seven empty and seven loaded barges.

(Continued on p. 11)

This Month in

Coal

FIRM '57—As the country went into June it became more and more apparent that 1957 will be a good if not exceptional year for business in the United States. This also means that it will be a good year for bituminous.

Exceptional years are not in the cards for bituminous now, and in fact the exceptional is less to be desired than a continuing period of increasing growth. Having made up the losses from the floods and stockpile draw-downs, bituminous in June was getting set for gains in the closing months leading to a net increase of at least 12 to 15 million tons over 1956.

BUILDING FOR '58 AND BEYOND—With '57 progressing favorably the bituminous industry was able to devote additional attention to growth plans.

Following up on the new advances in production equipment and methods featuring the May Coal Show of the American Mining Congress, bituminous leaders at the 40th anniversary meeting of the National Coal Association in June looked not only at the market potentials for tomorrow but at all the factors involved in meeting demands. Problems exist but the picture is one of matching modern mining and preparation with modern distribution to keep coal on the upward trend.

CONTINUING GROWTH—In laying plans for future expansion, coal was being provided with additional assurance that the expected growth in the economy on which its own growth will be based would, in fact, take place. As an example, one recent estimate places the gross national product—the value of all goods and services—at \$477 billion in 1960 and \$515 billion in 1962 (in terms of 1957 dollars). The estimate for 1957 is \$435 billion.

The rise in gross national product, however, is only part of the story for coal. One industry scheduled for more than double the average rate of expansion is generation of electric power. More than 50 million tons of additional steelmaking capacity will be needed in the next 18 yr, according to U. S. Steel.

EVEN RETAIL—June also was bringing further conviction that the home-heating market might end up by surprising a lot of people, including even coal men. This was a result of mulling over the proceedings at two May meetings—the American Retail Coal Association, at Chicago, at the Tri-State Anthracite Conference, at Elmira, N. Y.

Both were marked by a definite rebirth in dealer confidence in the future of home and commercial heating with coal, and Elmira itself was an object lesson in how anthracite can be sold to such consuming groups and made to stick.

INVESTMENT REINFORCEMENT—With activity in the first 5 mo indicating that 1957 will be a year of heavy investment in equipment to cut cost and raise quality, in addition to upping producing capacity, operating men were stressing even more the need for maximum output from these facilities with minimum labor. Consequently, each month brings news of additional standards departments in coal-mining organizations to make sure of getting an adequate return on their share of the more than \$300 million that will be invested in 1957.

Can profits keep pace with production?

To achieve production goals, you're probably spending more money on new equipment than ever before — an industry-wide total of \$1.5 billion between 1955 and 1960. But the fact remains: your profits depend heavily on how efficiently — and how long — your equipment serves you.

Lubrication, performed properly and periodically, can keep your new and old equipment operating efficiently over longer life spans. In the last analysis, it is your most economical method of cutting down-time and increasing tonnage per man shift.

For proper lubrication, use Texaco products. They're made for specific jobs. *Texaco Crater*, for example, keeps wire rope strong longer because it protects every strand, and encloses

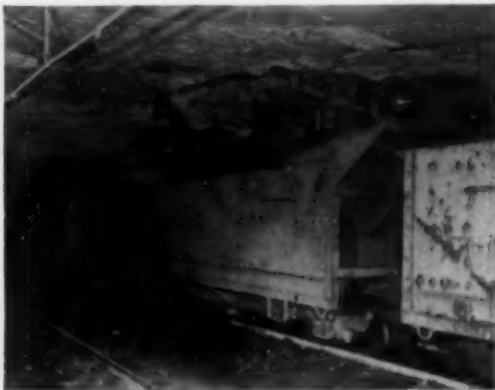
and seals the core. Its protective film prevents both rust and corrosion — minimizes wear by reducing internal and external friction. You can use it on hoist lines, draglines, slusher ropes. It's ideal, too, for open gears because it stays on the teeth — protects against wear.

Or for the application ease of a spray-on lubricant... use *Texaco Crater X Fluid*. It gives both gears and wire rope the same extra protection as regular *Crater*.

Consult your Texaco Lubrication Engineer for help in protecting new equipment during the critical break-in process and in prolonging the life of older machines. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States or write: The Texas Company, 135 East 42nd Street, New York 17, N. Y.



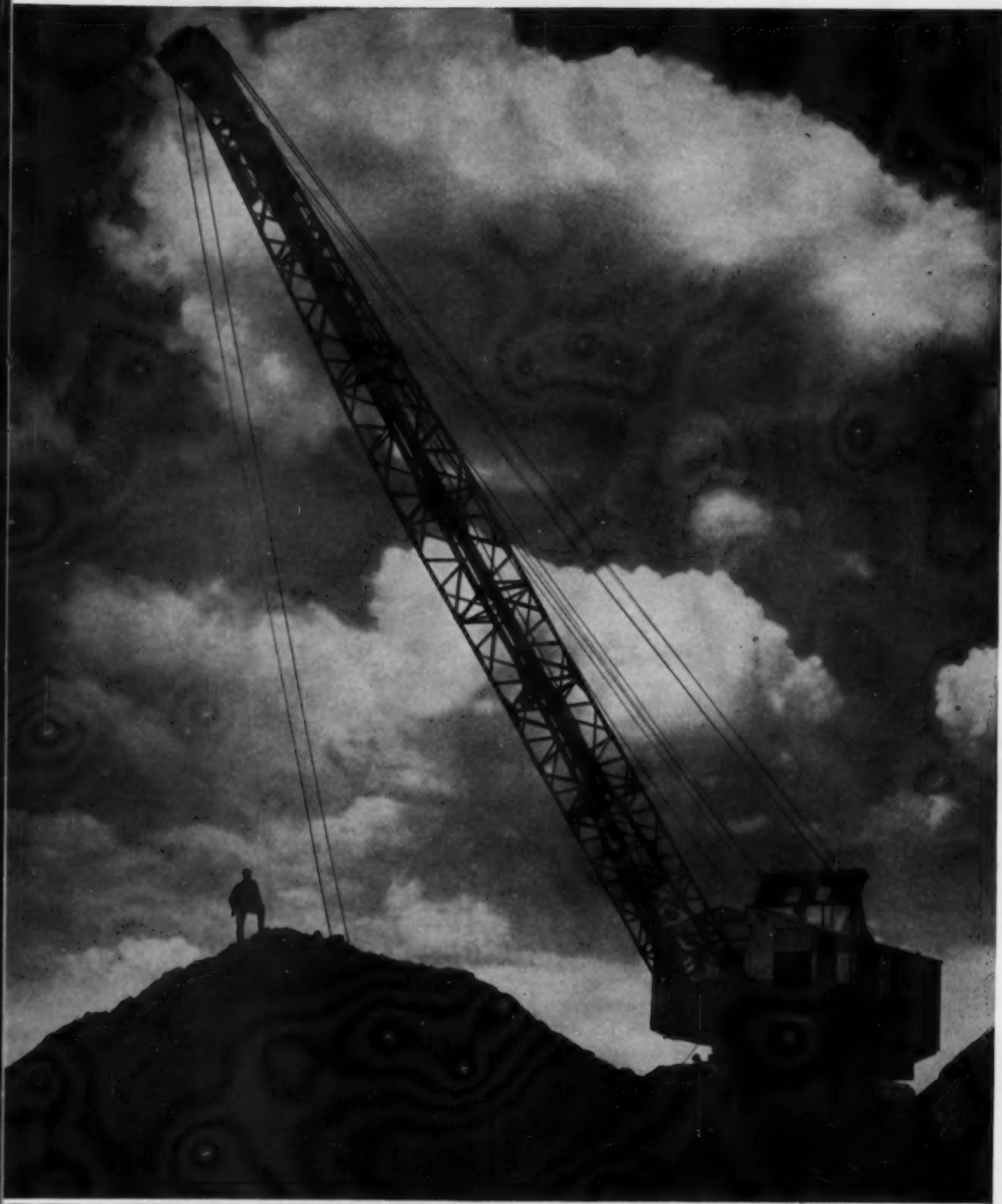
TRIPLE PROTECTION. Here, *Texaco Crater* (1) protects the wire ropes, (2) efficiently lubricates the sheaves and pulleys, and (3) protects the open gears against wear by cushioning shocks and heavy loads.



QUICK, EASY STARTS. *Texaco Olympian Grease* protects mine car wheel bearings against dirt, wear and moisture. It stays in the bearings, insuring easy starts at any temperature.



TEXACO



LUBRICANTS for the Coal Mining Industry

COAL AGE • June, 1957



HD-21 crawler tractor, 204 net engine hp
315 scraper, 20 yd heaped, 15 struck

YOU CAN STRIP OVERBURDEN AND RECLAIM LAND PROFITABLY *with this crawler tractor-scraper team*

There is a marked trend toward reclaiming worked-out pits—and a parallel trend toward the use of Allis-Chalmers crawler tractors and scrapers. Both are examples of wise management.

Land Reclamation—already a law in many states—eliminates to a large extent the scarred and worthless landscapes left by abandoned pits and piles of overburden. Properly reclaimed land usually returns far more than the cost of reclamation in higher resale value. Even where pits can be only partially filled, the land may be seeded profitably for pasture.

Allis-Chalmers HD-21 Crawler Tractor and 315 Scraper are ideal for this type of operation.

This team is mobile and flexible enough to strip overburden and spread it immediately in a worked-out area of the pit. This eliminates the need of re-handling overburden and of calling in specialized equipment.

Curved and offset cutting edge on the scraper, plus torque converter drive on the tractor, are just two of many features that put this Allis-Chalmers team in a class by itself for this type of work. Let your Allis Chalmers construction machinery dealer give you the details. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Engineering in Action

This Month in *Coal Age*

CONTINUED

Highlight—Power diagram shows DeKoven's setup for AC-powered mining.

► Stripping

The River Queen . . . Key to High Tonnage p 84

The River Queen Coal Co., Greenville, Ky., a joint venture of the Peabody Coal Co., and the W. G. Duncan Coal Co., will key its high tonnage operation (2 million tons or more) to the 55-yd River Queen shovel. Backing up a three-shift production pace scheduled to begin in August will be 100-ton hopper cars and a barge loading dock on the Green River 6½ mi away that will load at a 1,000-tph rate.

Sidelight: River Queen's washing unit—the new McNally-Pittsburg Giant washer.

► AMC Coal Convention Report

Efficient Mining Today p 88

Staff-written report of proceedings at technical sessions of American Mining Congress Coal Show at Cleveland, May 13-16, provides abstracts of papers and discussions on deep mining, stripping, coal preparation, safety and management affairs.

Foreman's Forum p 102

How to control the need for and high costs of overtime labor.

Operating Ideas p 108

Special Car for Timber Handling; jointed auger eases roof drilling; rack keeps roof bits handy; width indicator for continuous mining.

Equipment News p 114

Full quota of new-equipment writeups, includes those on an underground fire truck, a high-capacity stationary screen, an explosion-proof transformer in the 5-kv class and below, a power takeoff for engines up to 600 hp, and equipment for making rapid ash analyses.

News Roundup p 142

Solids-handling pipeline in service in the West; new \$150 million power plant in Alabama plans for initial capacity of 1,000,000 kw.

Coal Commentator p 12

Editorials p 53

CARL COASH, Publisher

IVAN A. GIVEN, Editor

Harold Davis
Managing Editor

A. E. Flowers
Associate Editor

W. A. Raleigh, Jr.
Assistant Editor

Daniel Jackson, Jr.
Assistant Editor

Christopher Elias
Assistant Editor

F. A. Zimmerli
Assistant Editor (Layout)

G. B. Bryant, Jr.
Washington

W. H. McNeal
Circulation Manager

Raymond H. Smalley
Business Manager

D. C. McGRAW JR., Advertising Sales Manager

NEWS BUREAU OFFICES: Atlanta 3; Cleveland 15; Detroit 26; Houston 25; San Francisco 4; Washington 4.
WORLD NEWS OFFICES: London, Paris, Bonn, Tokyo, Bombay, Rio de Janeiro, Mexico City

COAL AGE
VOLUME 62
JUNE, 1957
NUMBER 6

COAL AGE, with which are consolidated The Colliery Engineer and Mines and Minerals, is published monthly on the 1st with an additional Mining Guidebook number in mid-July, by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. PUBLICATION OFFICE, 1200 Noble St., Philadelphia 22, Pa. See box below for directions regarding subscriptions and change of address.

EXECUTIVE, EDITORIAL, CIRCULATION and ADVERTISING OFFICES, 330 West 43d St., New York 36, N. Y. Donald C. McGraw, president; L. Keith Goodrich, vice president and treasurer; John J. Cooke, secretary; Nelson Bond, executive vice

A McGRAW-HILL PUBLICATION



Member of Associated Business Publications and Audit Bureau of Circulations

president, Publications Division; Ralph B. Smith, vice president and editorial director; Joseph H. Allen, vice president and director of advertising sales; A. B.

Venezian, vice president and circulation coordinator. Subscriptions are solicited only from executives, management, engineering, operating and supervisory officials associated with companies engaged in the mining and preparation of anthracite, bituminous and lignite coal. Position and company association must be indicated on subscription orders. Send to address shown in the box below.

U. S. and possessions and Canada, subscription rate for individuals in the field of the publication \$3 per year, single copies \$1; elsewhere \$15 per year, payable in advance. Single copies \$2. Second-class mail privileges authorized at Philadelphia, Pa. Printed in the U. S. A. Title registered in U. S. Patent Office. Copyrighted 1957 McGraw-Hill Publishing Co., Inc. All rights reserved. Coal Age articles are indexed by Engineering Index. Coal Age's own index is published annually in the December issue.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, COAL AGE, 330 West 43d St., New York 36, N. Y. Subscribers should notify publisher promptly of any change of address, giving

old as well as new address and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

The Coal Commentator

Confirmation

Patent grants are one gage of where the emphasis is being placed in the design and production of mining equipment. Thus, those who follow the patent listings in the news section of this and other issues of *Coal Age* confirm in still another way their conclusions as to the directions in which manufacturers and coal men are going in the design and use of equipment.

Continuous mining and transportation presently lead the list in patent grants as well as in design and application. The grants include not only new machines but also improvements in components—cutting heads for example—for types already in existence. And since the bit is, after all, the essential item, since it is through it that the electric power is employed to break the coal, bits and holders also are involved in a number of patents.

All this activity is assurance that coal will continue to have new and improved continuous machines and facilities for low-cost deep production. And where, for one reason or another, continuous units may be less satisfactory, the regular appearance of patent grants and permissibility approvals in the news indicates that here, too, the operator will continue to have the best in equipment.

Mining Guide

"We are always coming up against problems and finding that we have to start from scratch because there is nothing available for reference."

"The standard handbooks don't provide the answers to mining problems today. Current know-how, plus careful study and investigation, are the foundations of progress in solving mining problems today."

These were two of the comments obtained in a field check among key operating men when *Coal Age* was preparing for its first Mining Guidebook in 1955. A re-check shows that they are still true today on the eve of the issuance of the 1957 Mining Guidebook, scheduled for Mid-July distribution.

Designed as a permanent reference, the Mining Guidebook provides—in one place, logically arranged—the basic information on which sound mining practice must be based, and also an up-to-date roundup of current practice and equipment. So you get both in handy form and supplemented by an up-to-date buying directory. And in 1957, you get as a bonus special sections on standards for production control and training of mine supervisors and employees.

Note from your commentator: Watch for your 1957 Mining Guidebook. Study it for ideas you can use immediately. Keep it for reference when you have a new problem or project.

Milestone

The pouring of the 100,000,000th ton of steel at E. Chicago, at 2:45 AM March 10, was rightfully treated as a milestone in its career by

the Inland Steel Co. In addition, it pointed up once again the close tie between coal and steel, especially since this 100,000,000th ton was used by the Differential Steel Car Co., of Findlay, Ohio, to make a mine car—one of 525 ordered by Inland Steel's coal-mining operation at Wheelwright, Ky.

A bow to Inland and Differential for reminding us so dramatically of coal's role not only in steel making but in the life of the Nation.

Heedless Horsepower

"A new deadly disease has the American people in its grip and no miracle drug is in sight to stop its frightful toll of human lives.

"Heedless horsepower is the chronic disease of the Age of the Automobile. Its symptoms are many and varied—the heavy foot on the accelerator, the eye fixed on the climbing speedometer, the hand on the horn, the mind idling while the car is in high."

The preceding is found in the latest in the series of annual reports on the highway traffic toll issued by the Travelers Insurance Cos., of Hartford, Conn. Like its predecessors, it is a morbidly fascinating document—so fascinating that your commentator must again call attention to it. Get it and read it. It is free. Maybe you don't need the reminders it contains, but it won't hurt to check your driving habits to make sure that none of them appear among those that result in injury and death. Like the Travelers, your commentator would like to have you around to read the next report—and many others to follow.

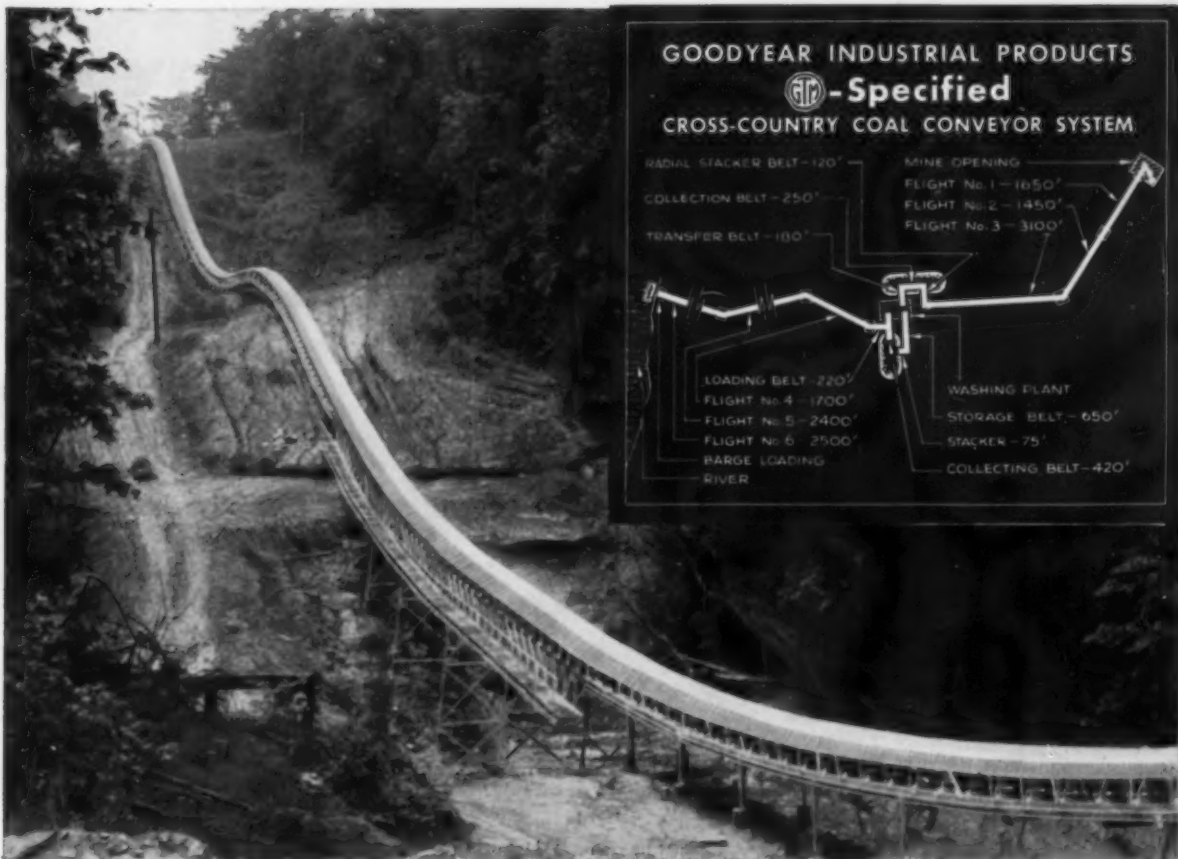
Drive safely, work safely, live safely.

\$2,500 Plus

Need \$2,500 in cash, plus a contract to supply architectural services for building a home to your design? That is the top award being offered by the Association for Applied Solar Energy, of Phoenix, Ariz., for the winning design for a solar-heated residence.

The fact that even the Solar Energy Association feels that present application of such energy is limited is evidenced by the fact that the design is to be particularly adapted to "Living With the Sun" in the arid Southwest. At the same time, the announcement of the completion, and of plans for building a house in accord with the winning design, are evidence that solar heat may find a limited application even today in certain areas of the world.

Thus, like nuclear power, which also may have limited application, or application only in certain areas of the world, solar energy is not likely to be a serious competitor of the mineral fuels, and particularly coal, for a long time to come. Ample coal reserves and a low cost per million Btus are two compelling reasons not only for not worrying about nuclear or solar energy in the United States, but for anticipating gains over the old-line competition—oil—and the new upstart, natural gas.



"Rubber Railroad" brings river to mine door—2½ miles away

A major coal company faced a major problem with the opening of a new mine in an isolated section of Western Kentucky. Success of the mine depended on their ability to take advantage of the low cost of barging the coal down the river—some 2½ miles away

Wheeled transportation was considered for the long haul over the heavily wooded, roller-coasting hills. But there were two serious drawbacks. First, the rough terrain would require a winding route and long trip times. Second, the company would lose some excellent, natural stock pile locations.

Then someone thought of conveyor belts and the

G.T.M.—Goodyear Technical Man. He not only confirmed the idea, but supported it to the hilt with the successful records of many similar cross-country conveyor belt systems. Result: The coal now rides to the river on rubber at the rate of 900 tons per hour in a smooth, profitable operation.

How can the G.T.M. and his conveyor belts help you with your haulage problems? It will be worth your while to find out by contacting him through your Goodyear Distributor or

Goodyear, Industrial Products Division,
Akron 16, Ohio.

GOODYEAR
 THE GREATEST NAME IN RUBBER

IT'S SMART TO DO BUSINESS with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."

Announcing
another mark of leadership!



Bucyrus-Erie's *New* 1650-B

STRIPPING SHOVEL

with 40- to 65-cu. yd. dippers

The new Bucyrus-Erie 1650-B stripping shovel offers a practical solution to a familiar stripping problem — economical coal recovery in the face of increasingly high overburden ratios. The 1650-B provides the necessary capacity and digging and spoiling range for efficient, big volume stripping. In addition, its unique flexibility offers a wide range of dipper capacities and boom and handle lengths, making it possible to select the most suitable digging combination for specific needs.

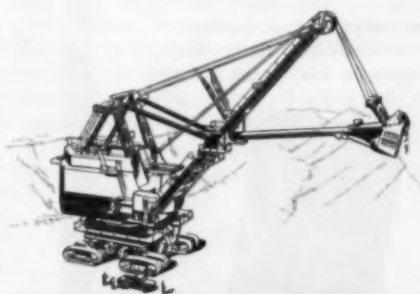
The 1650-B is available with 40- to 65-cu. yd. dippers, with dumping reach ranging from 178 to 135 feet. The machine illustrated here has a 55-cu. yd. dipper and a dumping radius of 147½ feet.

In every detail of its design, this electric-powered stripper is quality-built in the finest Bucyrus-Erie tradition. Throughout its history, the company has devoted its resources to the design and production of machines combining maximum long-time performance with minimum maintenance costs. As a result, Bucyrus-Erie stripping shovels and walking draglines have the range, capacity, speed and reliability to provide consistently high output at low operating cost. Their popularity attests to Bucyrus-Erie's leadership in stripping shovel design.

Let us help you with your stripping problems. We offer a complete line of stripping shovels and walking draglines from 2½- to 65-cu. yd. capacities.

123157C

The first 1650-B stripping shovel built is equipped with a long range front end and 55-cu. yd. dipper. Named the "River Queen," this shovel was custom-built to handle dual seam stripping at the River Queen mine near Central City, Ky. The mine is owned jointly by W. G. Duncan Coal Company and Peabody Coal Co., and operated by Peabody.



**BUCYRUS
ERIE**

South Milwaukee, Wisconsin

Specify

PERFORMANCE-PROVED

CARMET MINING MACHINE BITS

FOR YOUR EQUIPMENT



Joy 1-CM Continuous Miner

CARMET DISTRIBUTORS

Brace-Mueller-Huntley, Inc.
 Offices: Buffalo, Rochester & Syracuse, N.Y.
 Carbon Transfer & Supply Co., Helper, Utah
 Carlsbad Supply Co., Carlsbad, New Mexico
 Consolidated Supply Co., Picher, Oklahoma
 Crandall Engineering Co., Inc., Birmingham, Ala.
 Drillmaster Supply & Mfg. Co., Evansville, Ind.
 Gladstein Co., McAlester, Oklahoma
 Leechburg Supply Co., Leechburg, Pa.
 Marion Mine & Mill Supply Co., Whitewell, Tenn.
 McCombs Supply Co., Jellico, Tennessee
 Oglebay, Norton Mine Supply Div.,
 Offices: St. Clairsville, Ohio;
 Charleroi & Johnstown, Pa.
 Persinger Supply Co., Williamson, W. Va.
 Persinger's Inc., Charleston, W. Va.
 Union Supply Co., Denver, Colorado
 U. S. Steel Supply Co., Pittsburgh, Pa.
 W. B. Thompson Co., Iron Mountain, Michigan

From the many styles of Carmet cutter bits, there's one best suited to your particular conditions and the mining equipment you use. Carmet bits are proven performers in every mining area in the country, in all types of coal seams, even under the most adverse cutting conditions.

Extra-strong alloy steel shanks, specially designed to give greater support to the cutting tip, allow the use of a superior, more wear resistant grade of carbide. As a result, tool bit life is greatly extended for economy of operation and greater profit to you.

Your Carmet distributor will be glad to work with you in setting up a practical tooling program that will not only mean added production but, at the same time, will reduce your maintenance costs. Call him *today* for help in your mining tool selection. *Allegheny Ludlum Steel Corporation, Carmet Division, Detroit 20, Mich.*



Write for your copy
 of the CARMET
 MINING TOOL CATALOG
 and METHODS MANUAL

Illustrates full line of Carmet mining bits... giving tool dimensions, rake and clearance angles, etc. Specifies grinding wheels and procedures for reconditioning tool bits.

ADDRESS DEPT. CA-90

The Original DOUBLE-BONDED Carbide Bit

CARMET®



NSW 4409



21241

Patented and patents pending

FACE COST PER TON REDUCED TO ½ CONVENTIONAL MINING COST with a Goodman Continuous Borer

Here's a saving that really boosts profits...a saving established by accurate cost records covering a full 12 months operation of a Goodman Continuous Borer in the Pittsburgh #8 Seam. Furthermore, this record includes the cost of labor and maintenance as well as materials such as roof support supplies, rock dust, bits, oil and grease.

Now add to that another important saving. This Goodman Borer has mined upwards of 300,000 tons of coal in steady service without a major overhaul. In fact, an overhaul date has not even been scheduled.

At this operation the Borer is used for both solid and retreat work. Recently in retreat work, on three consecutive shifts, a total of 2584 tons was mined with a seven man crew. That's an average of 861.3 tons per shift or 123 tons per man per shift.

Arched sides and narrow span of flat roof are left by Goodman Borer. Bottom is wide and flat for good roadway.

21243



Other job data: Mining height, 7 feet; face crew—solid work, 8 men including roof bolter and foreman; face crew—retreat work, 7 men including foreman. Coal mined by the Continuous Borer is loaded from bottom by one loader serviced by two shuttle cars.

The Goodman Continuous Borer is the most consistent high tonnage producing machine available today. It has the power, durability and mobility to raise the working face efficiency level at its every installation. It represents an investment that can be written off in terms of greater productivity and lower cost per ton in a surprisingly short period of time.

Let us arrange for you to see a Goodman Continuous Borer in action. There's no obligation. Just write, wire or phone.

GOODMAN

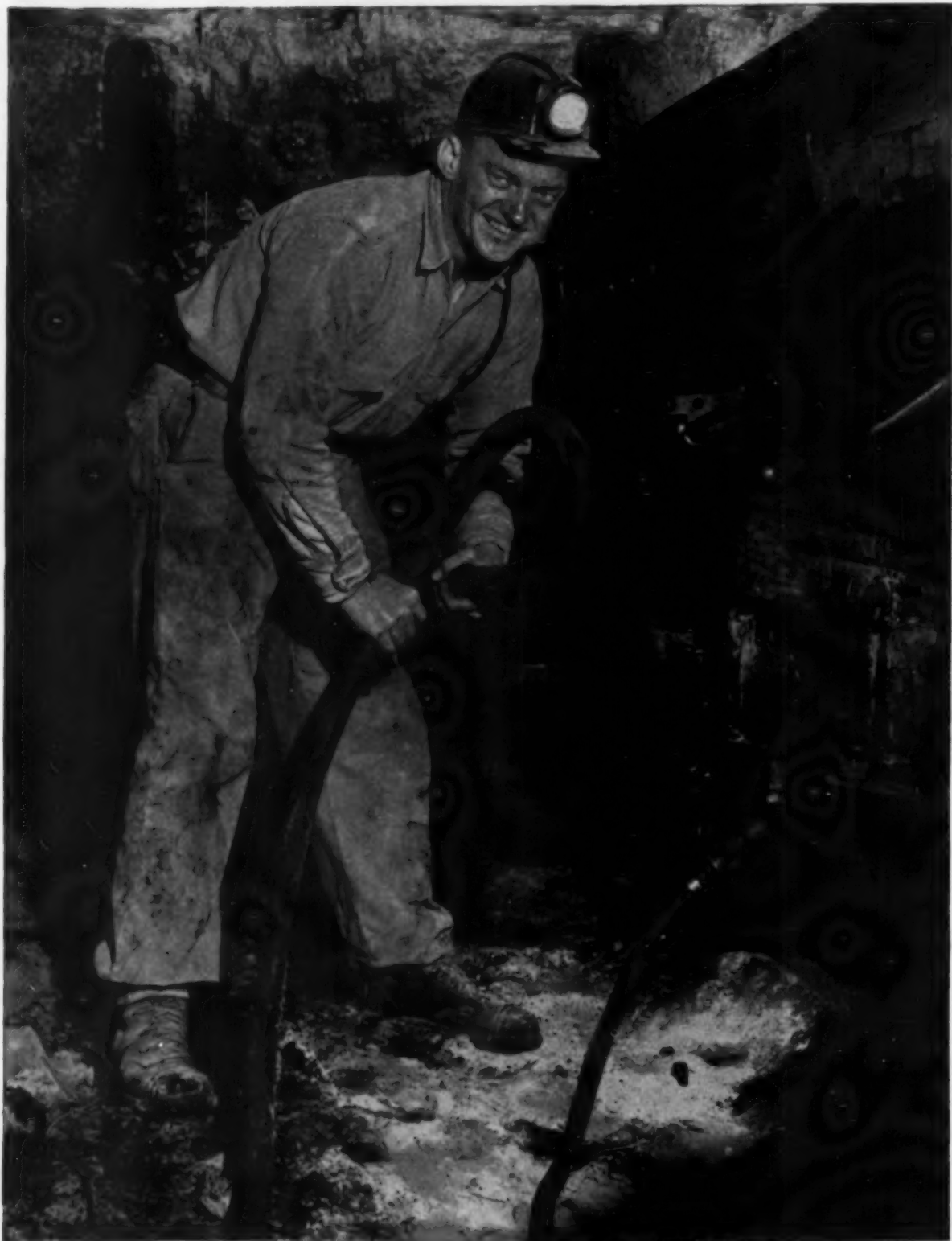
MANUFACTURING COMPANY

Halsted Street and 48th Place, Chicago 9, Illinois

CUTTING MACHINES • CONVEYORS • LOADERS
SHUTTLE CARS • LOCOMOTIVES • CONTINUOUS MINERS

Use Genuine Goodman Replacement Parts

If you watch cable costs



• 11 conductors in this continuous miner cable, yet see how flexible it is.

you'll like Tiger Brand

It's always a thrill to walk into a tough, cost-conscious mine and find that they are using huge quantities of Tiger Brand Amerclad mining cable. It vindicates our attitude that mining cable *must* be built to the very highest standards.

Our flat "Bridgewall" cable is an example. Tiger Brand flat twin mining cable in sizes #1 and smaller actually has a thick wall of neoprene between the insulated conductors. It locks the conductors and ground wire (if specified) in a tight embrace and holds them there—even when the cable is badly bent or twisted. No other type of construction is so durable.

Naturally, flame-resistant jackets are used throughout. And all of these very-heavy-duty cables are vulcanized in a lead mold under pressure, to insure a dense, tough jacket. *Money cannot buy a better cable!*

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



• This special cable was made for continuous miner. It contains power, grounding, lighting and communication conductors.

• Rubber-tired buggy fed with "Bridgewall" Tiger Brand. Cable is under continuous strain.



USS TIGER BRAND ELECTRICAL WIRE & CABLE



A STANDARD TIGER BRAND CABLE FOR
EVERY SPECIAL JOB

- asbestos wire and cable
- mold cured portable cord
- shovel & dredge cable
- paper & lead cable
- varnished cambric cable
- interlocked armor cable
- special purpose wire & cable
- aerial, underground and submarine cable

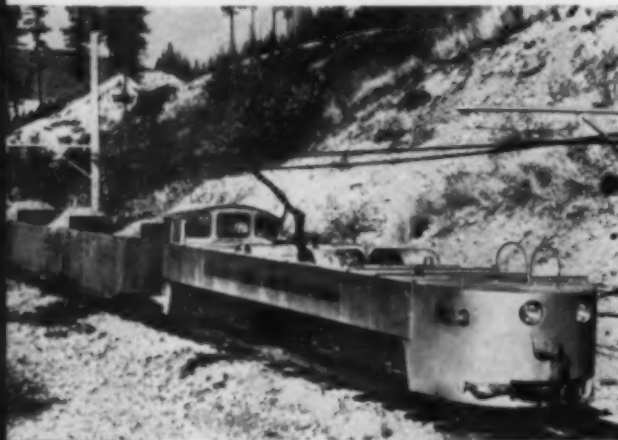


UNITED STATES STEEL

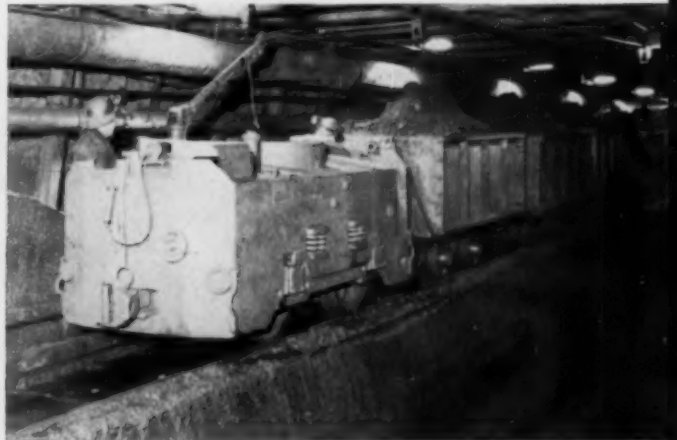


34,000 TONS OF MOLYBDENUM ORE are hauled each day from Climax Molybdenum Company's mine at Climax,

Colorado. Seven of these 20-ton General Electric swivel truck locomotives help maintain this record haulage.



11,000 TONS OF ORE DAILY with three 40-ton G-E locomotives in operation at The Consolidated Mining & Smelting Co. of Canada Ltd.'s Kimberly, B.C. lead zinc mine.



PLANNING FOR INCREASED PAY LOADS resulted in the purchase of six 8-ton G-E locomotives by Jones & Laughlin Steel Corp. for their Negaunee, Mich. Tracy Mine.

3 Mines Boost Haulage Output with Efficient, Dependable General Electric Locomotives

Whatever your mine haulage or gathering operations may be, there's a General Electric mine locomotive that's right for the job. In an increasing number of mines, as in the case of the three pictured above, G-E locomotives are proving that haulage output and efficiency can be significantly increased with the cor-

rect motive power applied to a particular haulage need. For more information, or for a free survey of your haulage needs at no obligation to you, contact your General Electric Apparatus Sales Office. General Electric Company, Locomotive and Car Equipment Dept., Erie, Pa.

110-95

Progress Is Our Most Important Product

GENERAL  ELECTRIC



FROM COAL

TO FUEL

TO PROFITS

*Ask the men who know coal
from the ground up*

For *Know-how*

Ask the

Achievement
SQUAW CREEK COAL CO.
Buckskin, Ind.
operated by
PEABODY COAL CO.



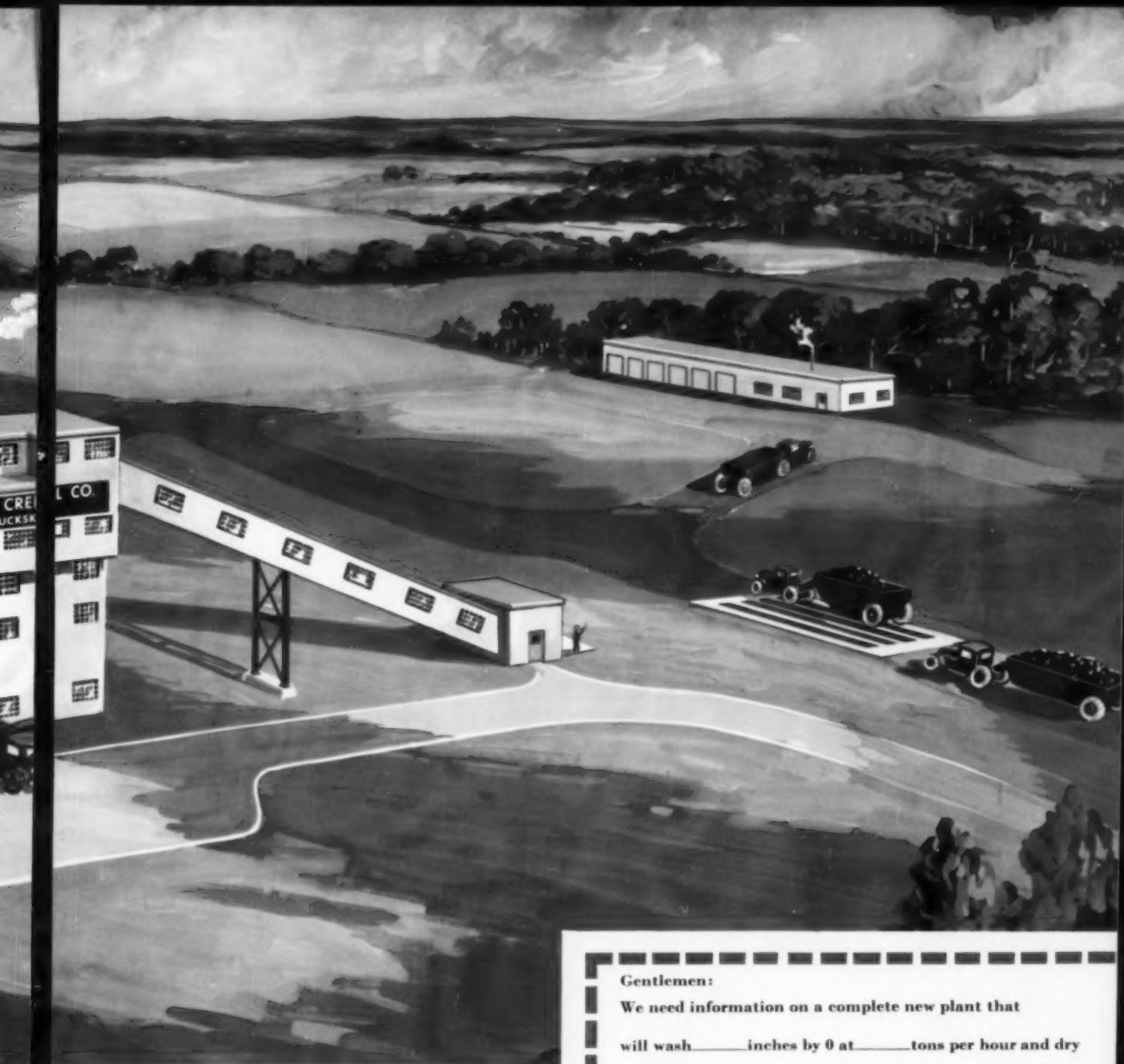
The Squaw Creek Coal Company, Buckskin, Indiana, prepares for the future with this plant, engineered for rugged, dependable production throughout.

Heart of this complete preparation unit is the McNally Giant Washer with a capacity of 750 tons per hour of 6" x 0 raw coal. Installation includes a crusher and rewasher for

middlings. Fines are recovered efficiently and clean 6" x 0 coal is delivered for continuous loading into railroad cars. A thirty-car, trip car haul draws in the empty cars on the adjacent tracks for subsequent loading.

And so, another plant is geared to the future—geared to take advantage of the growing demand for prepared fuel.

Men from McNally Pittsburg



Your coal, your plant needs, too, may be utterly different, but the men from McNally Pittsburg have the know-how to give you the same advantages. Ask us today how to assure your operation—changing COAL to FUEL—to PROFITS. Send the card.

McNally Pittsburg Mfg. Corp.

Gentlemen:

We need information on a complete new plant that

will wash _____ inches by 0 at _____ tons per hour and dry

_____ inches by 0 at _____ tons per hour.

Send information on the following special equipment:

Name _____ Title _____

Company _____

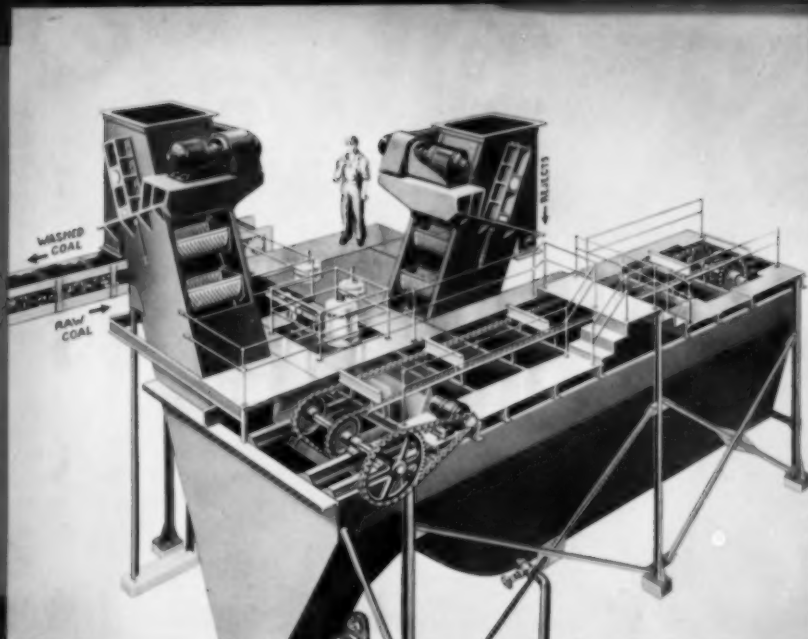
City and State _____

☐ Have Sales Engineer call for further consultation.

c

TESTED and PROVED

McNALLY PITTSBURG EQUIPMENT
MAKES COAL A BETTER FUEL

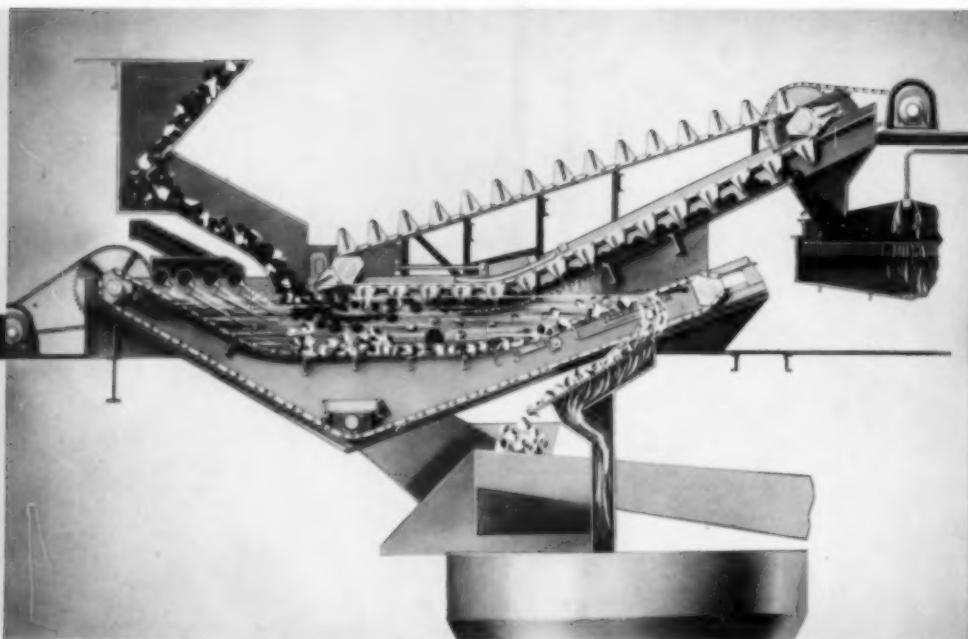


ABOVE

Ideal for the smaller plants, this McNally Norton Condensed Unit is easy to operate—does an efficient job.

LEFT

The best solution for your "Mean to Clean" coal problems, the McNally Tromp Dense Media process means high efficiency—low cost.



FIRST CLASS
PERMIT No. 93
(Sec. 363, P. L. & R.)
PITTSBURG, KANS.

BUSINESS REPLY CARD

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4c-POSTAGE WILL BE PAID BY—

McNally Pittsburg Mfg. Corp.

PITTSBURG, KANSAS

*Ask the men who know coal
from the ground up*

McNALLY PITTSBURG

MANUFACTURERS OF EQUIPMENT TO MAKE COAL A BETTER FUEL

McNally Pittsburg Manufacturing Corporation—Manufacturing
Plants: Pittsburg, Kansas • Wellston, Ohio

Engineering and Sales Offices: Pittsburgh • Chicago • Rio de
Janeiro • Pittsburg, Kansas • Wellston, Ohio

NEW—

for one-man mobile coal drilling ...

LONG

MOBILE HYDRAULIC COAL DRILLS

(USBM APPROVED)



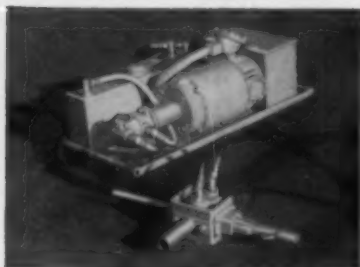
In the 1-M-20 Drill, high pressure permits high horsepower and allows one man to do the work of expensive mounted drills.



Model No. 1-M-20 (one man, 20 pounds) Drill



Model No. 1-M-30 (one man, 30 pounds) Drill



SD-10 unit is designed for mounting on "T" trucks or mobile cutting machines.



The TD-10 can be used with a trailer for supply haulage or conveyor pan moving.

Completely new in principle, these LONG Mobile Coal Drills permit one man to do the work formerly requiring two men with bulky high-priced mounted drills. They're designed with their own hydraulic power units to work at 2000 psi, which permits a weight of only 20 pounds for the 1-M-20 (suitable for drilling all powder holes), and 30 pounds for the 1-M-30 (applicable for Airdox and Cardox holes).

In this new design, an intrinsically safe electric control circuit means the electric motor operates and oil circulates only when the auger is rotating. This spells more efficiency of both electric motor and hydraulic

parts and permits a more compact unit because waste energy is not going into heat in the oil system when the auger is not operating. The independent hydraulic power unit avoids tampering with relief settings and provides the high pressure required for most efficient coal drilling.

LONG Hydraulic Tractor Drills are available as the TD-10 with self-tramming power unit, or as the SD-10 with power unit designed for mounting on "T" trucks and mobile cutting machines. Both the LONG 20-pound and 30-pound mobile drills can be used with either the TD-10 or SD-10, and can be quickly interchanged at the face.

For details or a demonstration, write ...

The

LONG

Oak Hill, W. Va.

Company



MINING WITH
DUMPTORS

...in open pits...and underground

Follow Koehring Dumptor through a typical load-haul-dump cycle, and you'll quickly see why it has gained such wide acceptance on all kinds of mine hauling, stockpiling, feeding hoppers, etc. First, notice how it saves time at the loader (above). Wide-flared 6-yard body, with low height, provides a big square target — 64 square feet, to be exact — for loading over either side or end by shovel, dragline or front-end loader. On the haul, Dumptor travels at the same speeds in either direction. *There's no need to turn* — an important advantage when working along narrow ledges, overhead trestles,

tunnels, etc. It accelerates fast, climbs 24% ramps or grades with capacity load. That's because there's better than 6 H.P. of "go" for every ton of loaded weight. At the dump area, *gravity* tilts the body, dumps the load *in one second*. There's no 15 to 25-second wait for slow-acting mechanical body-hoist — and no expensive hoist maintenance, because *gravity-dump* never balks, never wears out. You get all these advantages *and more* when you haul with heavy-duty Dumptors. See your local Koehring distributor about a demonstration, or write to us for the latest Dumptor® catalog.



Up-grade all the way — Near Mexico, D.F., 3 Dumptors haul rock and sand 600 feet up-hill from mine to hopper. In spite of steep, winding road, and normal loading delays, each Dumptor averages 150 loads per 12-hour day. These heavy-duty, 6-yard haulers, with their high ratio of H.P.-to-weight, can climb mine grades as steep as 24% fully loaded.



Dump time: 1 second — At hillside hopper, Dumptor drives up, body forward. Operator trips a body-release lever, and gravity tilts the body — dumps the load instantly. Free-swinging kick-out pan breaks load suction for fast, clean dump when hauling wet, sticky materials — bolts down to floor of dump body when handling heavy boulders like this.



Shuttles underground — There's no room to turn in this mine tunnel, and no need to turn. Koehring Dumptor drives up, gets its load, then shuttles back out of tunnel at the same speed as it entered. It operates with equal ease and speed in either direction — is as efficient underground as it is on inclined ramps, overhead trestles, or hauling on the surface.

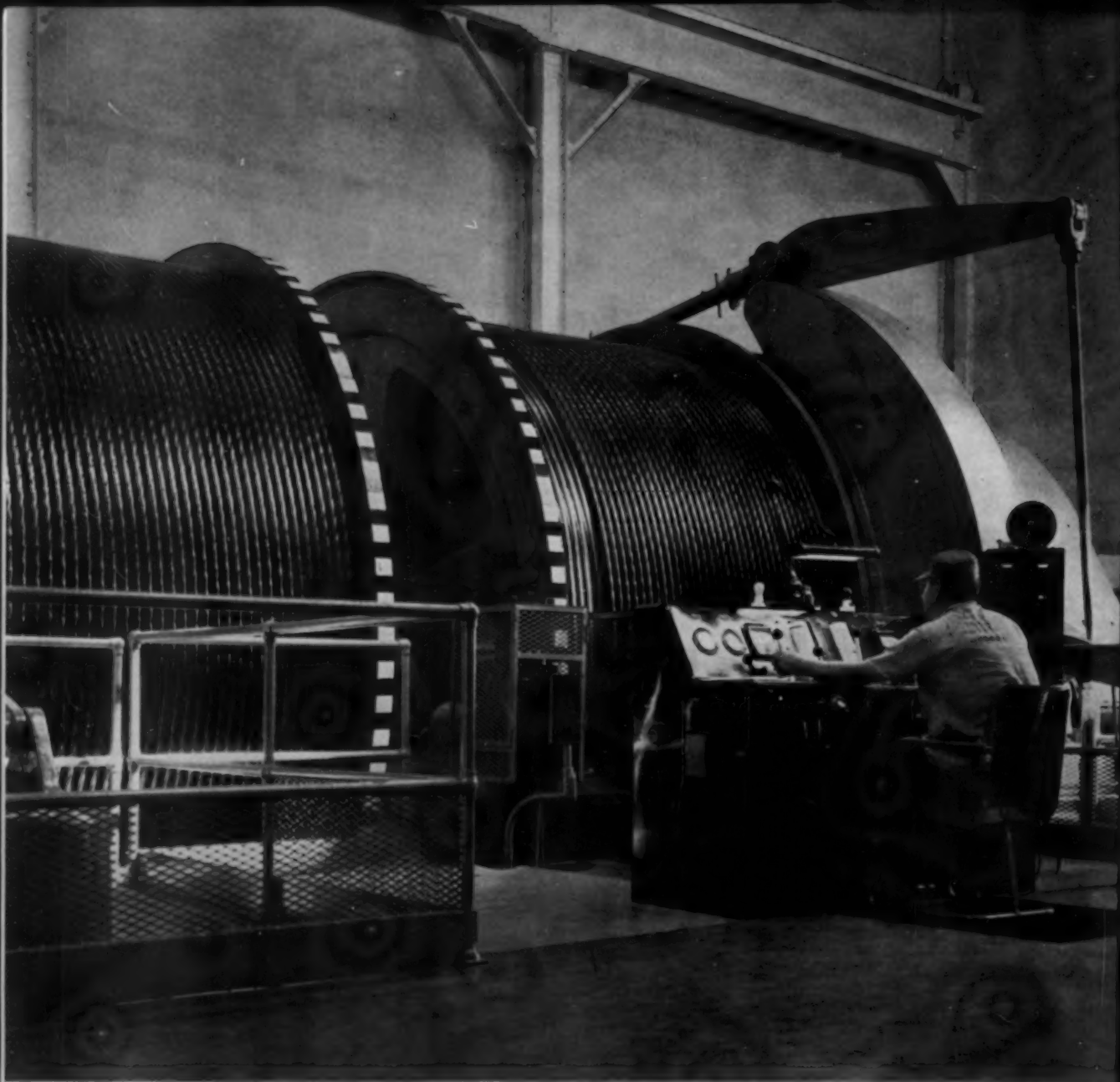


An inside job — To save rehandling of materials, 2 Dumptors haul clay from pit to processing plant, dump directly into hoppers inside the plant. Convenient end-dump, and no-turn shuttle hauling are especially practical on operations like this, eliminate turning and spotting in crowded work-areas. Handy, too, for stockpiling, and loading rail cars.

KOEHRING DIVISION OF KOEHRING COMPANY • Milwaukee 16, Wis.



8768



WIRE ROPE AT WORK

As an example of good housekeeping and all-around efficiency, this beautiful hoist installation would be mighty hard to beat. In service at an iron-ore mine, the powerful machinery is part of the balanced materials-hoist system. Each of the drums is equipped with several thousand feet of husky wire rope. A similar but some-

what smaller installation is provided for the cage hoist.

Those ropes so neatly spooled on the drums are Bethlehem flattened strand. They're big—2¼-in. diam. On the cage hoist (not shown in the photograph) the rope size is 1¾-in. Both installations use Purple Strand, of course—Bethlehem's top-grade rope with all the strength, endurance and toughness needed for heavy-duty mining applications.

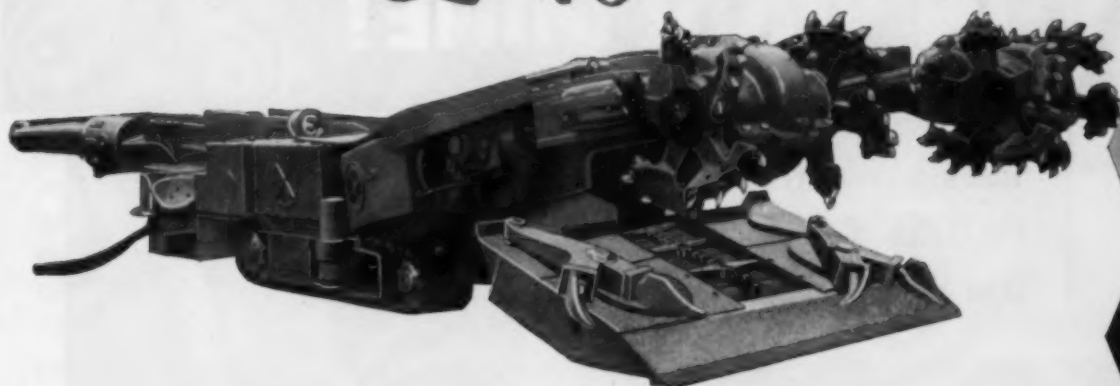
Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

MINING • QUARRYING • CONSTRUCTION • EXCAVATING • PETROLEUM • LOGGING • MANUFACTURING



HERE'S WHY THOSE WHO KNOW PREFER THE *Lee-Norse* MINER



PATTERN CUTTING—only *Lee-Norse* has it.

CUTS MORE COAL WITH LESS POWER . . . cutters revolve and oscillate at the same time—milling the coal from the face.

CUTS A COARSE PRODUCT—FEWER FINES . . . cutter bits follow a right and left spiral direction producing a diamond pattern which breaks off in coarse cuttings.

A SIMPLE, STURDY MACHINE . . . essentially a modern loading machine on which is mounted a set of efficient cutting heads.

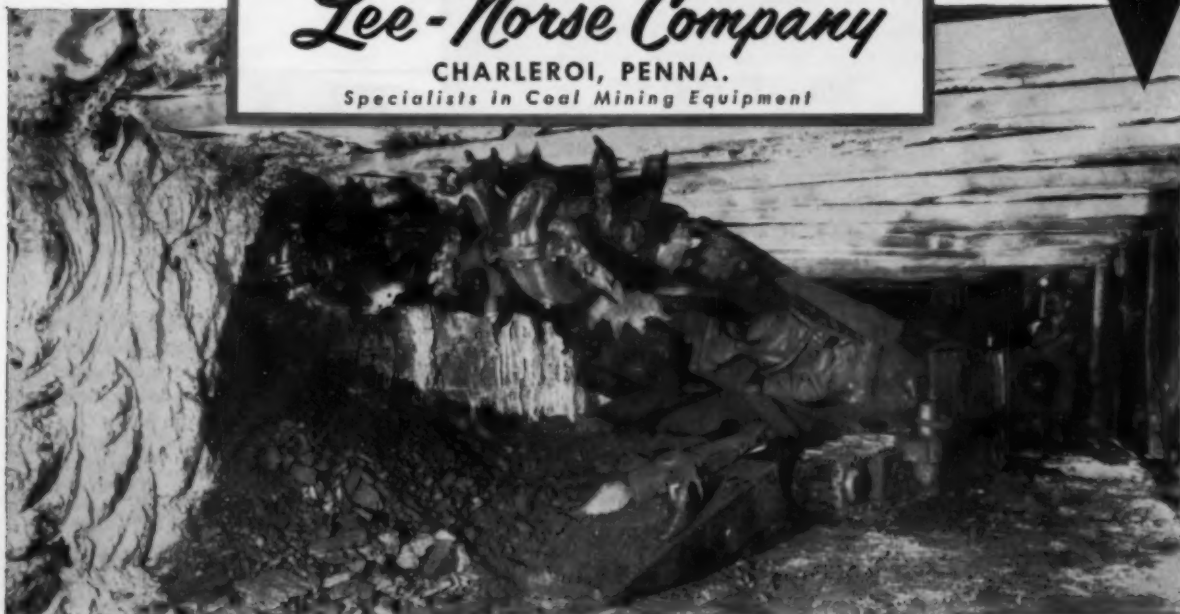
HIGHLY MANEUVERABLE—FAST TRAMMING. . . not a “muscle-bound giant” . . . it quickly follows any variation in seam thickness.

EXCELLENT CLEAN-UP . . . improved dual gathering arms load all the coal into a flexible rear conveyor.

Lee-Norse Company

CHARLEROI, PENNA.

Specialists in Coal Mining Equipment



BUILT FOR BOLTING IN YOUR MINE!

That's why more mines use
FLETCHER Roof Control Drills
than all other makes combined!



For **LOW** Seams



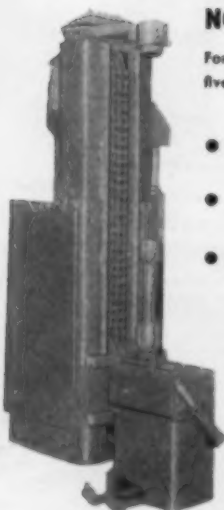
For **HIGH** Seams

NOW . . . Continuous MINER DRILLS

For installation on ripper miners as shown, and
five new styles to work with boring-type miners.

ADVANTAGES

- Flex-mounting
to allow bolting while mining.
- Mast against roof
to provide safety and stability.
- Rugged construction
for low maintenance.



THERE are FLETCHER Roof Control Drills designed for seams varying from 30" to 14 feet in height. And, because each mine has special requirements — variations in Roof Height, Roof Hardness, Bolt Length, Bolt Pattern, Capacity, Mine Voltage, Mining System, etc. — FLETCHER machines are tailored to meet these prob-

lems. FLETCHER offers complete flexibility of dimensions or features to meet your specifications. So—if your roof drilling problem is high bit cost, tough materials, or slow bolt installation rate — you'll want to learn more about FLETCHER Roof Control Drills. See your FLETCHER representative.



J. H. FLETCHER & CO.

P. O. Box 353, HUNTINGTON 8, WEST VIRGINIA
Phone 44186

The Right Pick is

important. That applies to choice of trailing cords and cables, too. Be guided by the fact that veteran mine-men prefer TIREX. This expertly engineered cable, newly improved for greater flexibility, has cured-in-lead Neoprene Armor that resists abrasion, oil, heat and water ... gives maximum wear.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street,
Cambridge 39, Mass.

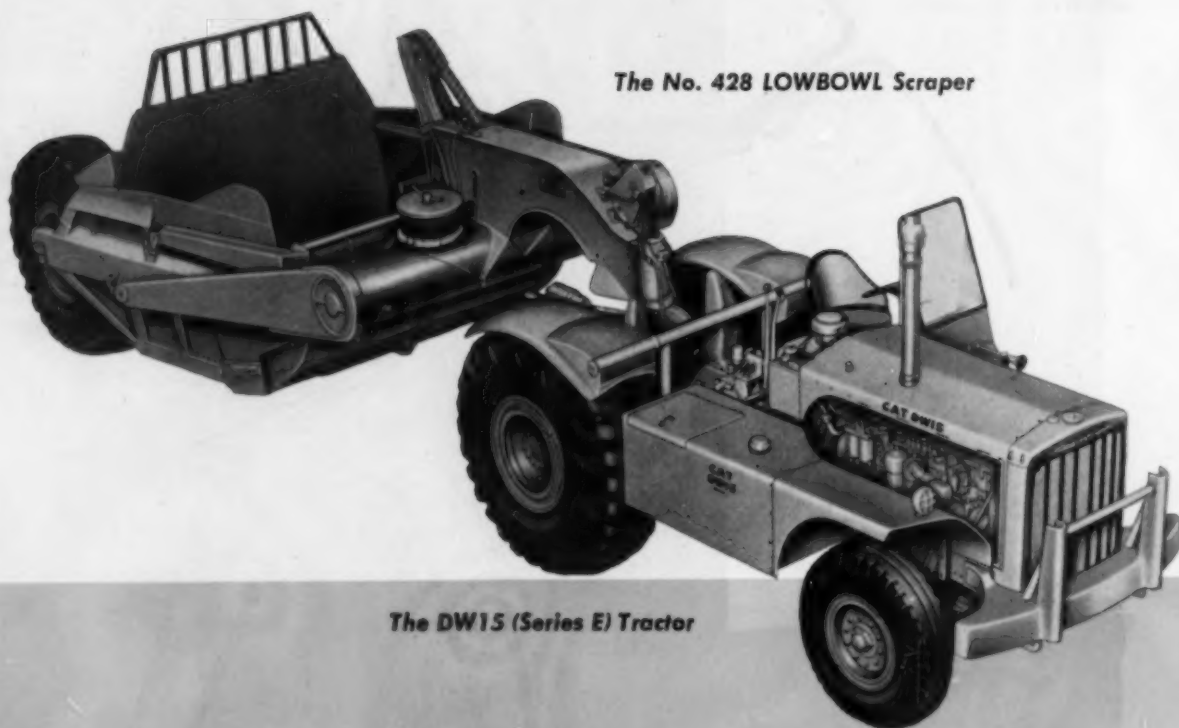


Simplex - **TIREX**



CATERPILLAR ANNOUNCES

NEW DW15 (SERIES E) AND NEW No. 428 LOWBOWL SCRAPER



The No. 428 LOWBOWL Scraper

The DW15 (Series E) Tractor

Here's a new Cat team loaded with features that add up to one thing—**A HIGHER PRODUCTION RETURN ON YOUR INVESTMENT.** See your Caterpillar Dealer for details on this great team's performance.

GET THE STORY IN BRIEF ON THE OPPOSITE PAGE ►

A GREAT TEAM: The performance of the DW15 (Series E) Tractor and No. 428 Scraper can be summed up simply: bigger loads—faster.



FACTS ABOUT THE DW15 (SERIES E) TRACTOR

Around the world, the DW15 has proved that it can move material faster and more profitably than competitive machines in its class. Now there's a new DW15 (Series E) to give you even higher production. This is the story:

ENGINE: A new Caterpillar D326 Engine, designed especially for the DW15 (Series E), develops 200 HP (maximum output capacity).

And Caterpillar research has produced a 23% torque rise in this new engine! This means that high tractor rimpull is maintained through a wide range of travel speeds in each gear, and the need for gear changing is decreased. In fourth gear, for example, over 3,000 pounds of rimpull are delivered at travel speeds from 9 MPH all the way to 18 MPH. A new engine, yes—but with these traditional Caterpillar advantages: uses inexpensive No. 2 furnace oil without fouling; needs no fuel system adjustments; requires no cleaning of fuel injection valves.

TRAVEL SPEED: The DW15 (Series E) offers ten speed selections, from 2.7 to 37.2 MPH. But, more important, it provides four-wheeled sure-footedness—the ability to use the speed on the job. Operators ride with more comfort, feel greater stability. They travel faster, and in safety.

MANEUVERABILITY: Four-wheeled stability means faster cycle time because the DW15 (Series E) can make short radius turns at higher speeds. It can turn without stopping inside a 35-foot diameter and in a smaller area through use of a turn-back-turn maneuver.

VERSATILITY: The DW15 (Series E) provides versatility that far surpasses similar sized two-wheeled machines. It can be unhitched from its scraper and

used as an independent unit to tow compactors, water wagons or other units, and it can be teamed with the Athey PR15 Wagon for rock hauling work.

FACTS ABOUT THE No. 428 LOWBOWL SCRAPER

CAPACITY: Struck—13 cu. yd.; heaped—18 cu. yd.

ADVANCED DESIGN: There is more to Caterpillar's exclusive LOWBOWL design than a low bowl profile. Width and length proportions are designed to give maximum loading efficiency. And every component—particularly the apron, ejector, cutting edge—is likewise designed to do its part in achieving capacity loads.

LOADABILITY: The final result of this careful engineering is this: bigger loads—faster. LOWBOWL design gives the new Caterpillar No. 428 Scraper a faster loading rate because incoming material meets less material resistance and less friction from the load already in the bowl. While other scrapers are still in the cut struggling for the last few yards of their load, the new Cat units are on their way to the fill—with big pay loads!

NEW FEATURES: Outstanding new features of the No. 428 include: increased ground clearance—for high-speed travel in rough going; increased apron lift—for faster ejection of any material; large area pushblock—for better pusher contact.

NEW TIRES FOR THE DW15-No. 428

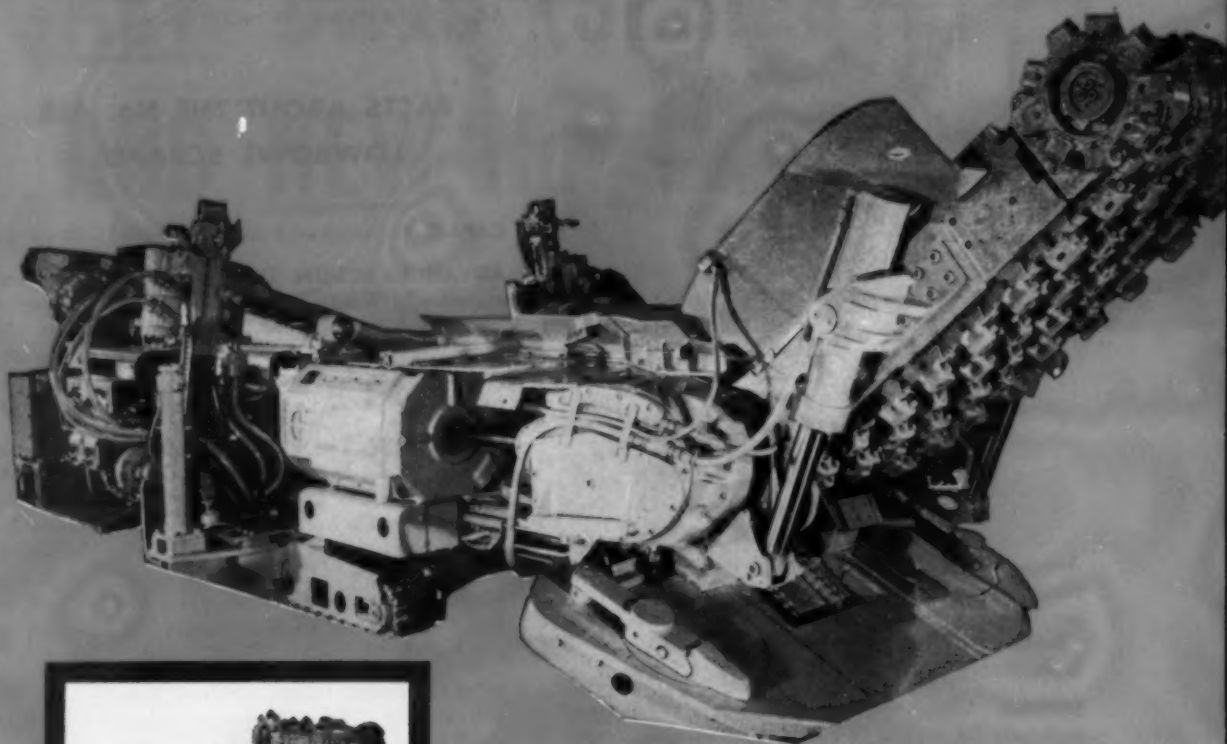
Both the CAT® DW15 (Series E) Tractor and No. 428 Scraper feature 26.5-25 wide-section tubeless tires—the product of extensive co-operative research by Caterpillar Tractor Co. and leading tire manufacturers. Tubeless tires offer load-carrying capacity comparable to conventional tires at a reduced inflation pressure. This gives better flotation and traction while decreasing rolling resistance. The wider tire treads take a "grouser like" bite, making more efficient use of engine horsepower. And tubeless tires eliminate 80% of the down time caused by tire failure.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

ONE GOAL: To concentrate our capabilities, resources and experience on the design, manufacture, distribution and service of job-tested heavy equipment.



① *GATHERING ARM CLEAN-UP*

The rugged clean-up works on the same proven principle as Joy Loaders . . . speeds up pillar extraction. The operator can clean up old workings, rooms, and crosscuts . . . in an 18' room, the miner can clean up the entire bottom to within 8" of rib.

② *EXTRA LARGE RIPPER HEAD*

The 42" wide ripper head with extra deep sump (increased to 21") results in greatly increased tonnages. The new head also results in more ripped coal and less fine coal.

③ *DIRECT ACTING SHEAR JACKS*

More powerful shear jacks easily maneuver the extra large ripper head. These jacks eliminate chains and linkages; reduce maintenance. Jacks are inverted . . . keeps dust from cylinders.

25% Higher Tonnage

The New **JOY 1CM-3** Miner

Produces 4½ Tons Per Minute

THESE

NEW FEATURES

MAKE IT POSSIBLE

21" SUMP

GATHERING ARM CLEAN-UP

**42" WIDE RIPPER HEAD
DIRECT ACTING SHEAR JACKS**

**INCREASED POWER
250 HP STANDARD
276 HP WITH ROOF DRILLS**



**WRITE FOR
BULLETIN
182-1**

The new Joy 1CM-3 is a 47" high continuous miner for driving entries, mining rooms and extracting pillars, in seams 60" and higher. It is an entirely new machine with every new feature engineered into it as a result of Joy's long experience in the continuous miner field. It has the power to produce up to 4½ tons per minute.

Less time is involved in clean-up operations because of a completely new clean-up design that works on the gathering-arm principle. The new clean-up handles draw slate and old workings.

Find out how the new 1CM-3 will fit into your operations . . . write
**Joy Manufacturing Company, Oliver Building,
Pittsburgh 22, Pa.** In Canada: **Joy Manufacturing
Company (Canada) Limited, Galt, Ontario.**

JOY

EQUIPMENT FOR MINING . . . FOR ALL INDUSTRY



CONTINUOUS MINERS



LOADERS



DRILLS



CUTTERS

W&W CL 6682-182



Carbon steel formerly used in this Simplicity aggregate drier wore out from smashing impact after handling 1¼ million tons

of crushed dolomite but life expectancy is now over 4 million tons. Drier operates in one of the plants of The J. E. Baker Co.

Lukens "T-1" steel triples life of rock drier

TRADEMARK

Are impact and abrasion shortening the life and rocketing the costs of your equipment? If so, there's a lesson here for you:

When the liner shell and partition plates of this 10 x 20 foot Simplicity aggregate drier were replaced with Lukens "T-1" steel, life expectancy increased threefold!

Whether you handle stone, coal, or metal ores, it will pay you to investigate Lukens "T-1" steel for surfaces hard-hit by impact and abrasion. The 321 minimum Brinell quality has been known to outlast ordinary steels by 18 to 1. Applications are many throughout the materials handling and

processing industries. Wear plates, chutes, hoppers, and mine cars are typical.

The remarkable combination of hardness and toughness in this high yield strength, readily welded alloy steel is even maintained at temperatures well below zero. Send for informative illustrated book-



let, "Lukens 'T-1' Steel." Write Manager, Marketing Service, Room 902 Lukens Steel Company, Coatesville, Pennsylvania.



Helping industry choose steels that fit the job



McCarthy Model No. 14-30-36 Coal Recovery Drill

McCARTHY AUGER DRILL BORES COAL FOR \$2 PER TON

including make-ready, operation, maintenance, depreciation and hauling

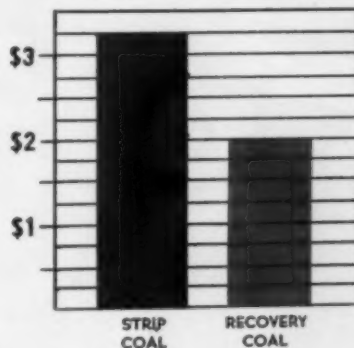
Auger-mine low-cost recovery coal.

One Southern Ohio strip mine operator produced approximately 10,000 tons of recovery coal per month with only one McCarthy Model 14-30-36 Coal Recovery Drill, working one six-hour shift per day with only two operators. The cost per ton, including make-ready, operation, maintenance, depreciation and hauling, was only \$2.

This is why more operators each year add McCarthy Coal Recovery Drills to their list of production equipment. The McCarthy drill is a cost-saver and a money-maker. It's self-moving, all hydraulic, and requires only two operators. Contact the nearest Salem Tool representative for details. For immediate service, phone or write direct.

It Pays to Auger-Mine Low-Cost Recovery Coal

MINING COST PER TON*



*Based on 10,000 tons of augered coal per month.

Manufacturer of Drilling Equipment Since 1901

THE SALEM TOOL CO.

763 S. ELLSWORTH AVE. • SALEM, OHIO

U. S. A.





P&H

your leading
for

HARNISCHFEGER

Construction & Mining Division • Milwaukee 46, Wisconsin

shovel all jobs



P&H Model 1855 Electric Shovel with 10 cu. yd. dragline stripping overburden at mine near Philipsburg, Pa.



P&H Model 1800 Stripper rated as 8 cu. yd. Electric Shovel in operation at a bituminous mine near Birmingham, Alabama, equipped with 65 foot boom and 7 cu. yd. dipper.



P&H Model 655B with 1½ cu. yd. dipper maintains high production in loading on a coal stripping job in West Virginia.

The **P&H** Line

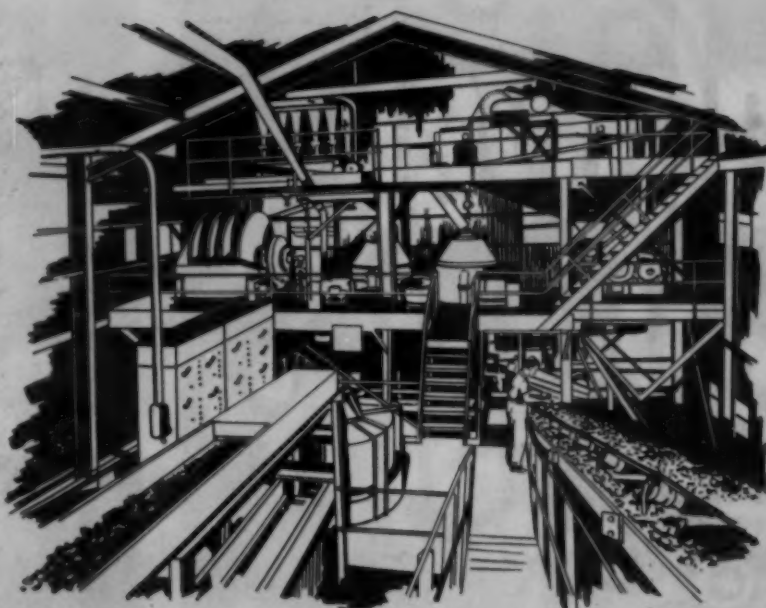
Electric Shovels from 3½ through 8 cu. yd.

Excavators from ½ through 3½ cu. yd.

Truck Cranes from 8 through 45 ton capacities.

This modern plant processes over 100 tons per hour of $\frac{3}{4}$ " x 0" raw coal feed. Specifications call for clean coal of not more than 5½% ash. Surface moisture is reduced to under 7½% without heat drying.

Complete Fine Coal Washing and Thermal Drying Plant built by H & P to complement existing coarse coal preparation plant. $\frac{3}{4}$ " x 0" raw coal is fed at the rate of 140 tons per hour. The clean coal averages 4.75% ash and has a surface moisture of 3%. Plant bleed under normal operating conditions has been 50 GPM at less than ½% solids from the refuse circuit.



The one new Fine Coal Washing Method— The HEYL & PATTERSON Circuit

A scientifically designed Fine Coal Washing and Water Clarification Plant using the "H & P Circuit" relies on the proven combination of H & P Cyclones, Reineveld Centrifuges, and the new Fluid Bed Dryer for superior performance and low-cost operation.

When you talk to an H & P sales engineer about your fine coal recovery problems, he is backed by the experience of our research department which developed the H & P Self-balancing Circuit after years of painstaking field and laboratory tests.

Since 1891, Heyl & Patterson has designed and built many coal preparation plants. We have adhered to the firmly established basic idea that the exacting requirements of economical coal preparation demand careful engineering analysis and development of flow-sheets. These are tailor-made for your specific requirements, to permit maximum recovery and to comply with stream pollution legislation. *Heyl & Patterson has given the coal industry the correct facilities for preparing coal for specific markets, assuring high standards of accuracy and uniformity for its customers.*

The newest development in this challenging field is the application of the H & P Circuit to Fine Coal Washing and Water Clarification Plants. Many of these plants are now in service and their daily operating records confirm these advantages:

- Lower initial investment
- Lower operating and maintenance cost
- Full 100% recovery of all solids reporting from the clean coal discharge of the washing equipment
- Closed water circuit operation where desired

You, too, can enjoy these and other advantages if the layout and design of your Preparation Plant are the result of proper design and equipment application by H & P specialists.

Eliminating all guesswork is the surest way to customer satisfaction. Let us prove our point.

Send for informative brochure on Fine Coal Jig, Reineveld Fine Coal Centrifuge, H & P Cyclones or general Coal Preparation Plant Bulletin.

When Experience Counts . . . Count on Heyl & Patterson!

Heyl & Patterson

INC.

55 FORT PITT BLVD. • PITTSBURGH 22, PA.

70
YEARS OF SERVICE

BRADFORD COAL BREAKERS
CAR DUMPERS
CONVEYING SYSTEMS
REINEVELD CENTRIFUGAL DRYERS
THERMAL DRYERS
WET CYCLONES



Efficiency of New Sun Rust-Preventive Grease is shown by accelerated test. Rusty test plate (left) was coated with ordinary grease. The large amount of



rust was formed during a 48 hour immersion in synthetic sea water. Plate (right) protected by new Sun rust-preventive grease is wholly rust free after 48 hours

NEW GREASES PREVENT HARMFUL RUST

**Sun rust-preventive greases give improved lubrication
...protect against wet or humid operating conditions**



In 48 Hour Synthetic Sea Water Test, rust from plate coated with ordinary grease has turned water yellow (left). Water remains crystal clear in beaker with plate protected by new Sun rust-preventive grease (right).

Water contamination in grease-lubricated parts reduces lubricant life, promotes corrosive wear, and may lead to failure of bearing surfaces.

Sun Oil's new rust-preventive greases are specially fortified to overcome this problem. They give extra protection against both direct water contamination and indirect water contamination caused by high humidity and condensation during overnight and week-end shut downs.

Available at the price of ordinary greases, new Sun rust-preventive greases come in many different grades. For complete information, see your Sun representative, or write for Sun Technical Bulletin 38. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. GI-1.

INDUSTRIAL PRODUCTS DEPARTMENT
SUN OIL COMPANY
PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO & MONTREAL



PLEASE TURN TO NEXT PAGE



New buttery grease now protects against rust under highly adverse moisture conditions.



New tacky grease prevents throw-off...reduces consumption. Highly resistant to water.



New high-temperature grease for anti-friction bearings. Exceptional stability, longer life.

NEW SUN RUST-PREVENTIVE GREASES SAVE YOU MONEY IN 3 WAYS

- Prevent wear...and rust...on 90% of all grease jobs
- • Serve as low-cost rust preventives for storing shop equipment
- • • Save storing and handling special-purpose greases

Sun Oil Company's new greases are fortified to protect against rust. Lubricity is improved and wear is reduced because grease-lubricated parts are now protected at all times against rust and corrosion caused by condensation and process water.

The effective life of these new rust-preventive greases is approximately twice that of conventional greases operating under wet conditions. And, their extra protection against moisture permits their use as a rust-proofing medium for shop storage of tools and parts.

Competitively priced with ordinary greases, these new greases can be applied by any conventional method...brush, swab, pressure gun, or through central pressure systems.

Because of their improved quality, these new Sun greases will now perform 90% of all grease lubrication jobs. You reduce grease inventories...lessen the risk of using the wrong grease...simplify your handling problems.

For complete information, see your Sun representative or write **SUN OIL COMPANY**, Philadelphia 3, Pa., Dept. GI-2.



INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY, PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

In cramped quarters like this, Tournapull Rear-Dump turns in dump position, which moves rear wheels forward for extremely short wheel-base. With bowl raised, 22-ton capacity C Tournapull, shown, turns 180° in only 20' 8" wide area, without backing.

Short 180° turns



boost pit output, cut handling costs

If you are interested in cutting cycle time on your pit hauls, consider Tournapull Rear-Dumps.

These high-production units are extremely maneuverable, can back into a shovel or restricted dump area faster than any haulers on the market. They make 180° turns by power steer thru geared king-pin in less than their own length. They eliminate time normally wasted maneuvering back and forth to turn in narrow quarters. They also frequently eliminate expense involved in construction of skid-plates or special turn-around areas.

Even where space is unlimited, rig's 90° prime-mover-turn gives you faster cycles. At the shovel, fast-maneuvering Tournapull Rear-Dump swings in and positions in 1 quick move. Loading unit need not sit idle while hauler operator wastes time on a wide sweeping turn, and a long, slow back-in. Quick, safe

spotting saves additional production time at grizzly or dump.

Simplicity reduces maintenance

A great deal of your usual maintenance expense is also eliminated because of the simplicity of Tournapull's turn mechanism. Steering involves only an electric motor, connected to a rugged ring gear king-pin shaft. A flick of operator's finger activates motor . . . causes prime-mover to pivot up to 90° around trailing unit. Turns are made quickly, regardless of footing. There are no front steering knuckles, no reach rods, no complicated mechanisms to get out of line, maintain, or repair.

Check these, and all the other advantages of Tournapull Rear-Dumps. See for yourself how they speed haul cycles and cut costs. Write or call, any time, for owner-verified production studies and specifications. There's no obligation.

These features, too, cut your hauling costs

Hauls anywhere—Travels safely over narrow haul roads, paved highways, city streets . . . hauls cross-country over terrain, thru muck, rock, and soft fill.

Dumps fast, clean—Electric motor lifts body quickly to any desired dump angle . . . bowl tips behind rear wheels for clean over-bank spill. Streamlined body sheds material readily.

Cuts weather delays—Power-transfer differential applies extra power to wheel on firmest footing . . . pulls rig through mud, sand, soft materials.

Rugged body loads easily—Big bowl opening is easy loading target. Three layer, all-steel bowl with tool-steel floor resists wear and shock. Available with optional tailgate.

Improves safety—More than 4 times the braking surface of ordinary haulers plus optional electrobrake, low center of gravity, excellent visibility, front-wheel drive, easy control, all contribute to maximum safety.

Reduces fatigue—Big tires and air-foam cushioned seat smooth out ride for operator. Electric power steer and 2-way power dump make work easy.

Insures future earnings—Behind basic prime-mover you can interchange other trail units: scraper, bottom-dump, lift-and-carry crane, logging-arch, flat-bed hauler. Keeps your Tournapull busy at a profit all year-around.

Tournapull—Trademark Reg. U.S. Pat. Off. R-1168-M-5

Model	Capacity	HP	Overall Length	Width req'd. for 180° turn Travel position	Dump position
D	11 tons	138	24'10"	24'8"	18'8"
C	22 tons	210	29'9"	28'8"	20'8"
B	35 tons	293	35'10"	35'	27'



LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

WHERE QUALITY IS A HABIT

PREPARATION PERFORMANCE

preceded by

60

Successful Years . . .



A **FAIRMONT** -built Preparation Plant
is in a class all by itself

YOURS: All the modern developments plus all the exclusive
advantages of **FAIRMONT** -engineering and **FAIRMONT** -construction

FAIRMONT MACHINERY COMPANY

FAIRMONT, WEST VIRGINIA

DESIGNERS AND CONSTRUCTORS OF COMPLETE COAL PREPARATION PLANTS USING BOTH WET
AND DRY CLEANING, CENTRIFUGAL AND THERMAL DRYING.



Clean-up takes only a few minutes per shovel because of Tournatractor's 17 mph forward and 7.2 mph reverse speeds. In addition to saving time, speedy tractor-on-rubber keeps loading sites and haul-roads cleaner because it can get around to each shovel more times per day than a crawler-tractor.

Rubber-tired tractor

speeds clean-up around 3 shovels

1 fast machine replaces 2 crawler-tractors

Working their Eagle Mountain Iron Mine, Eagle Mountain, California, Kaiser Steel Corp. find they get more clean-up work done faster with 1 Model C Tournatractor than if they assigned 2 crawler-tractors to handle the same job. The new tractor-on-rubber replaced one full-time crawler, and does the part-time plant and pit-maintenance work formerly assigned to a second track-type machine. The change to the faster, more maneuverable 210 hp Tournatractor enables the mine to keep haul units moving with less delays due to spillage or uneven pit floors.

3 to 4 times faster than crawlers

Tournatractor handles all clean-up assignments around 3 shovels. It shuttles back and forth at speeds up to 17 mph, which is 2 to 3 times faster than the top speed of most crawlers. In addition, reverse speeds to 7.2 mph allow unit to back away quickly without interfering with load-

ing operations. Big, 21.00 x 25 low-pressure tires provide plenty of flotation and traction. They stand up well despite abrasive and rocky footing around pit floor.

Also used for pulling and pushing

In addition to clean-up and bulldozing, the 210 hp tractor pulls air compressors to drilling sites and moves the frame supports which

carry electric cable for shovels, drills, and other equipment.

Get all the facts

Owners around the world are taking advantage of the ease of maintenance, durability, speed, and high production of the Tournatractor. If you are interested in these same benefits for your pit, get all the details from your Distributor today.

Tournatractor—Trademark Reg. U.S. Pat. Off. CT-1548-M-1

Tournatractor also cuts downtime for air compressors and other equipment when moving them from one location to another. Tournatractor

gets on the job quicker...gets to the next assignment quicker. 1500 ft. is less than a minute away.



LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS
A Subsidiary of Westinghouse Air Brake Company

WHERE QUALITY IS A HABIT

Announcing Performance Certified

MINE ROOF BOLT MATERIAL CONTROL CERTIFICATE

Republic Steel Corporation hereby certifies that the mine roof bolts included in mill order number _____ were made from the following steel:

HEAT NO. _____ YIELD POINT (PSI) _____ YIELD POINT (POUNDS) _____ BREAK POINT (POUNDS) _____

The above figures are correct as contained in the official records of the Corporation.

BY _____ CHIEF METALLURGIST, BOLT AND CHAIN DIVISION

REPUBLIC STEEL CORPORATION
General Offices • Cleveland 1, Ohio

MINE ROOF BOLT MATERIAL CONTROL CERTIFICATE is individually filled out for each shipment of Republic Mine Roof Bolts. Information shows specific strength characteristics for the particular heat or heats of steel from which bolts were made. This exclusive Certification Program is your guarantee of consistent quality in Republic Mine Roof Bolts.

REPUBLIC



World's Widest Range of Standard Steels

Republic Roof Bolts

...your guarantee of dependable, top-holding strength

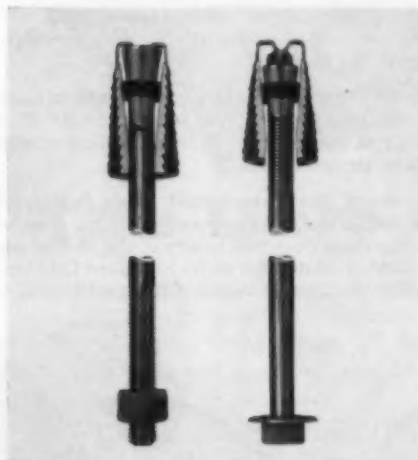
Here's real news for mine operators who want 100% assurance of dependable, high strength in every roof bolt installed. It's Republic's new Mine Roof Bolt Certification Program. Through this means, Republic, and only Republic, now furnishes positive evidence of the superior performance of every mine roof bolt shipped, based on actual tests. Here's how the program works:

First, as a basic steel producer, Republic is in complete control of every heat of steel used for Republic Roof Bolt manufacture. Chemistry is precisely regulated to provide required physical properties.

Next, prior to roof bolt production, samples of each heat are physically tested to destruction in the metallurgical laboratories of our Bolt and Chain Division. Complete data are compiled—including yield point in pounds per square inch, plus yield point and break point in pounds for the actual bolts produced.

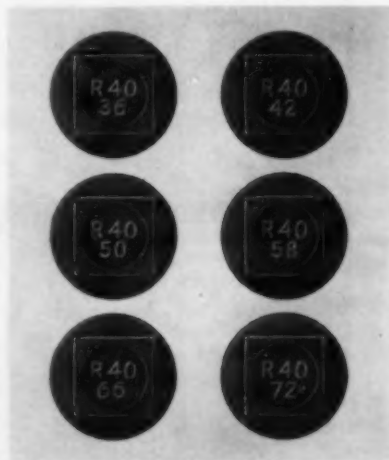
Finally, each heat is kept separate throughout manufacture, and final bolt bundles are numbered accordingly. On shipment, Republic furnishes a Mine Roof Bolt Material Control Certificate showing specific information on the particular heat or heats of steel from which the bolts were made. In every case, yield and break strengths are guaranteed to meet or exceed the physical requirements contained in Specification ASTMA-306, latest issue, as submitted by The Committee on Roof Action to the Industry as mining standards. Best of all, every Republic Mine Roof Bolt now produced is covered by the Certification Program, at absolutely *no extra cost* to you.

It will pay you to get all the facts on Republic's complete line of **PERFORMANCE CERTIFIED** Mine Roof Bolt Assemblies, designed to meet every overhead condition. Simply contact your local Republic office, or mail coupon.



OUTSTANDING PERFORMANCE of Republic Mine Roof Bolt Assemblies is exactly predicted by the new Certification Program. Republic offers all four major classifications of assemblies, plus technical assistance in selection and installation. Types shown are forged wedge head bolt and square head bolt with wedge head and rigid expansion shell.

POSITIVE IDENTIFICATION OF REPUBLIC ROOF BOLTS is forged into the head of each unit. "R" stands for Republic, numerals alongside indicate steel analysis, and the lower number shows length. Republic Roof Bolts are available from 36" to 72" long in standard sizes. Longer lengths can be provided on special order.



STEEL

and Steel Products

REPUBLIC STEEL CORPORATION

DEPT. C-4040

3121 EAST 45th STREET • CLEVELAND 27, OHIO

Please send me information on:

- ☐ Mine Roof Bolt Assemblies
☐ Material Control Certification Program

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

How to get better coal hauler engine performance—

use **STANDARD**
DIESEL FUELS

STANDARD Diesel Fuels—now with STA-CLEAN*—deliver the big benefits that help you get (1) the power your coal hauler engines are rated to deliver, (2) the performance economy you must have, (3) the low maintenance costs that mean profitable operations.

STA-CLEAN is a STANDARD Diesel Fuel exclusive. This additive prevents fuel-injector sticking, insures clean burning of the fuel, prevents rusting of tanks, fuel lines, and injector parts.

Clean fuel. Standard exercises special care in handling diesel fuel to make sure it's delivered to you as clean as it was when it left the refinery. Contamination is eliminated. There's no foreign matter in the fuel to cause engine failure or maintenance problems.

Balanced distillation of STANDARD Diesel Fuels means good, as well as economical, performance; and with cleaner engine operation, you may be able to extend overhaul periods for your coal haulers.

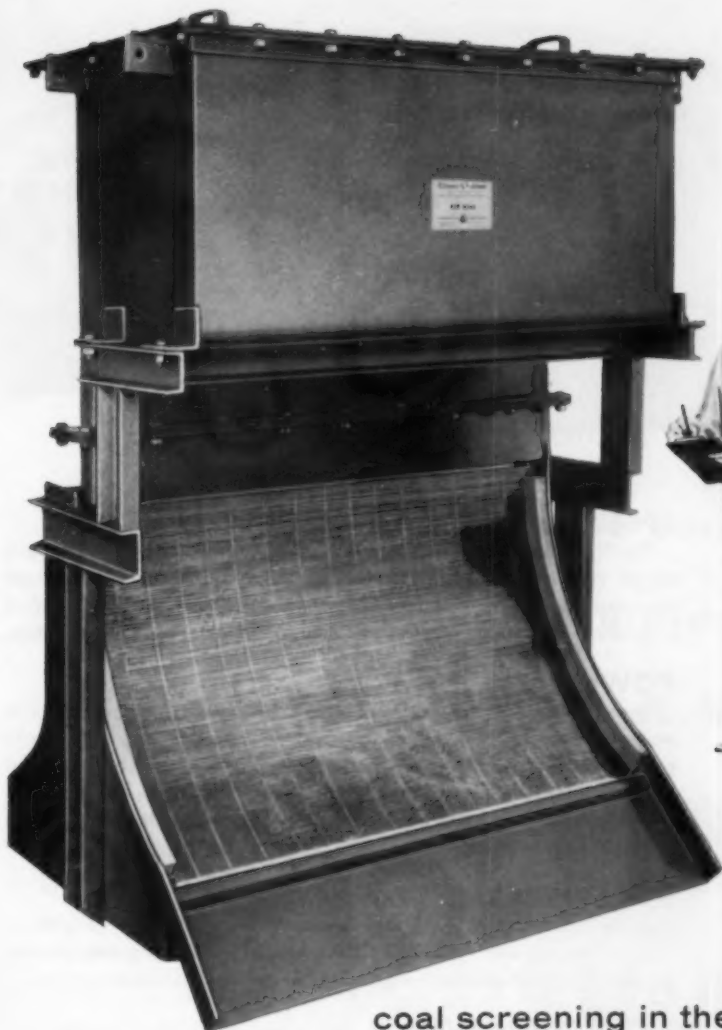
Low pour point. STANDARD Diesel Fuels delivered to operators in cold climates have a pour point of -20° F. or lower . . . plenty of margin here to insure uninterrupted operation at low temperatures.

Get the facts about STANDARD Diesel Fuels from your Standard Oil industrial lubrication specialist. There's one of these specialists near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

*Trade Mark

STANDARD OIL COMPANY
(Indiana)





ZOWIE

... higher capacity wet
coal screening in the 8-48 mesh range with

The Dorr-Oliver DSM Screen

The latest and one of the most significant advances in the Dorr-Oliver line of classification equipment is the Dorr-Oliver DSM Screen . . . developed for the high capacity wet screening of coal in the 8-48 mesh range.

Capable of handling exceptionally large flow volumes, the DSM Screen will effect separations at capacities greatly in excess of other units now operating in this size range. The compact and economical stationary design requires very little floor space . . . no special

For more information on this newest tool for the mining industries, write for a copy of Bulletin No. 2300. Dorr-Oliver Incorporated, Stamford, Connecticut.

support required other than that for piping. Installation and operating costs are low . . . no moving parts result in minimum maintenance.

Available in four standard sizes from 1 to 4 ft. in width the DSM Screen can provide from 200 gpm of 48 mesh undersize per ft. width to 500 gpm of 8 mesh undersize per ft. width.

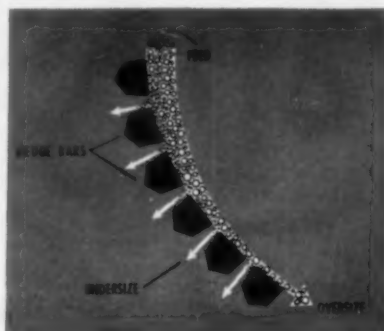


DORR-OLIVER
INCORPORATED

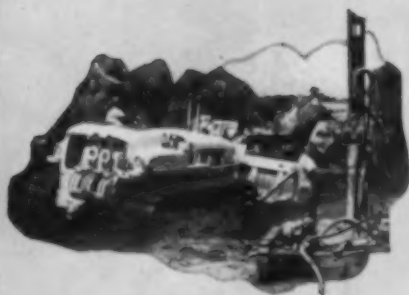
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
STAMFORD • CONNECTICUT • U. S. A.



Illustrative drawing showing
principle of separation



Here's why Euclid TC-12 Twin-Power Crawlers give you MORE WORK-ABILITY



PERFORMANCE

On a 200' push at a coal mine in Pennsylvania, the TC-12 moved about 440 loose yards per hour.

On a Michigan stockpiling job, the TC-12 moved 796 tons of loose coal in one hour on a 150' push.

On a coal strip mine operation in Ohio where waste banks had to be levelled, a TC-12 produced about 950 yards per hour with a 50' push.



SPEED

The TC-12 has speed—up to 7.8 mph forward or reverse—but that's not all. Pivot turns (one track forward and one reverse at the same time) plus changing of direction and range under full power without loss of momentum save considerable time during the tractor's daily operation.

POWER

Two engines with a total of 436 h.p. (413 net h.p. at drive train) make this Euclid "Twin" the world's most powerful crawler. Being more powerful, the TC-12 offers additional benefits, such as faster work and longer engine life, since the engine often operates at less than full capacity without strain. And, the reserve power permits handling the toughest tractor job.

MANEUVERABILITY

Pivot turns with the TC-12 take less space and time. Changing directions on the go with Torqmatic Drives makes maneuvering into position quicker. Split-half construction gives better traction on uneven ground.

EASY OPERATION

Clutching and shifting are eliminated with the TC-12 "Twin". There's 24-volt push-button starting and instant response to directional levers, range selector and hand throttle levers, all of which are conveniently located to allow complete freedom of the operator's right hand for control of attachments.

DESIGNED FOR EASY SERVICING

Many design features contribute to long life and easy servicing. Location of radiator behind operator reduces damage and improves cooling. Track tensioning and recoil system are automatic. All engine accessories are readily accessible from outside the engine compartment. Rollers can be removed without breaking track. Engines, Torqmatic Drives, and planetary final drives can be removed without disturbing the other components.

**THEY ALL ADD UP to just one thing—
Euclids are your best investment.**

**EUCLID DIVISION,
GENERAL MOTORS CORPORATION, Cleveland, 17, Ohio**



Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE





Mining motors
for heavy-duty mine equipment
depend on performance-proven
ROCKBESTOS A.V.C.

In building motors for heavy-duty coal mining machinery, leading motor manufacturers depend on performance-proven Rockbestos A.V.C. Motor Lead Cable.

For example, in building motors for use in Joy Manufacturing Company's 20BU-1 high capacity loader, the manufacturer specified and used Rockbestos Motor Lead Cable. This cable not only withstands oil and grease but also gives protection against starting overloads, high ambient temperatures and the many other operating tortures of heavy-duty mining equipment.

This Rockbestos A.V.C. Motor Lead Cable has also been performance-proven in mill motors and other heavy-duty stationary and traction-type motors.

You, too, can get trouble-free wire performance by specifying and using Rockbestos A.V.C. Motor Lead and Apparatus Cable. Remember, it'll keep its flexibility indefinitely — won't rot or bloom when exposed to grease — won't burn or carry flame.

Write today for full details — ask for Specifications RSS-98.



ROCKBESTOS

PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT

NEW YORK, CLEVELAND, DETROIT,
 CHICAGO, PITTSBURGH, ST. LOUIS, LOS ANGELES,
 ATLANTA, DALLAS, OAKLAND, SEATTLE

**ONLY YOUR
International distributor
can make this deal:**

**Four-
for**

**Buy your job-sized
4-In-1 on tracks or
rubber from a
complete line of
profit-producing rigs.**

Now—why tie-up useful money or “strap” your credit by “over-equipping”? Why spend upwards of four times as much for several limited-duty machines which one 4-In-1 can replace—and outproduce?

An International Drott 4-In-1 gives you 4-machine usefulness for one moderate investment. Yes, the exclusive and revolutionary 4-In-1 gives you instant availability of 4 big-capacity machine actions!

You get world-beating Skid-Shovel excavating-

All-in-1 International Drott 4-In-1

“Carry-type scraper”

with “see-easiness” of front-mounting—
to grade, strip, spread, or compact with
amazing, inch-close accuracy!



Skid-Shovel...

with Drott's exclusive, “concrete-smash-
er,” triple-power pry-action break-out—
and 42” ground-level bucket roll-back!



machine job-capacity One-machine price!

loading performance. You get exclusive multi-purpose "carry-type scraper" action. You get production-boosting clamshell action. You get "radius-controlled" bulldozer action with big-yardage earth-rolling ability!

You get 4-In-1 versatility unlimited for a fraction of the price of the machines it can replace and outperform, on job after profitable job!

And you can have 4-In-1 advantages teamed with all-condition International crawler traction, or rubber-

tired Hough Payloader speed!

See your *International Distributor*—he's the only one who can offer you a 4-In-1 deal! He's the only one who can save you the thousands of dollars that 4-In-1 ownership assures—by giving 4-machine utility for one moderate investment. And he can prove the "heap of difference" in 4-In-1 performance on tracks or rubber—against anything else in the field! See him soon for a demonstration!

gives you...

Clamshell...

that "surrounds" loose materials and lifts in one fast gulp—gives you "hopper-high," self-clearest dumping action.



Bulldozer...

with clam lip up, and skid shoes on the ground, the radius-controlled blade rolls the earth with precision!



**ONLY YOUR
International distributor
CAN OFFER THESE
EXCLUSIVE FEATURES!**

**Here's
job-range.**



**Exclusive triple-power
pry-action break-out**

Inbuilt ability to deliver tremendous excavating force enables this TD-9 4-In-1 to yank out deeply embedded old masonry piers. You see typical, on-the-job advantages of true and exclusive International Drott pry-over-shoe break-out action—the only design that gives you the three absolute essentials: (1) Full hydraulic power transfer from full piston-face power-push; (2) Long lever to apply full pry-power; (3) Fixed fulcrum of frame-mounted skid-shoes, to concentrate pry-force!



**Exclusive parallelogram
raise action**

No eccentric tipping to cause spill-back and lose yardage! The 4-In-1 has non-spill, roll-back level—all the way up. Compared to ordinary front-end loader performance, this feature, alone, can increase your daily yardage up to 18%! You can bottom-dump the 4-In-1 as a clamshell...and do it 2½-foot higher than ordinary roll-forward buckets. And bottom dumping eliminates the sticky materials problem—where other rigs foul up and can't get the job done!

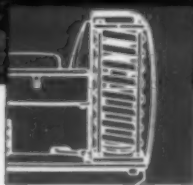
**Check these other famous
International Drott Exclusives!**

- **STANDARD EQUIPMENT.** Three-valve design, to provide hydraulic control power for attachments.
- **STANDARD EQUIPMENT.** Double-bottom, bridge-truss bucket to insure 4-In-1 strength to match pry-action.

- **STANDARD EQUIPMENT.** Yoke-type supports to insure linkage strength to back 4-In-1 capacity!
- **STANDARD EQUIPMENT.** Magnetized dip stick to prevent damage to hydraulic system from minute abrasives!

Only your International Distributor can offer you the big money-making advantages of International Drott exclusive 4-In-1 features. Only he can deliver you job versatility unlimited, in the world's only multi-purpose machine of its type! Prove to yourself that your correct size of 4-In-1 can replace and outperform a whole machinery yard full of limited-duty rigs. Ask for a demonstration!

s where 4-in-1 gets world-beating
e... capacity... stay-put performance!



Exclusive shock-swallowing Hydro-Spring

Capacity-boosting, machine-protecting Hydro-Spring is a hydraulic cylinder enclosed in a heavy-duty locomotive-type coil spring. Shock force displaces oil from main lift cylinders into the Hydro-Spring cylinder—extending it and compressing the big spring to absorb and cushion impact loads. Slamming the 4-In-1 bucket into hard material—dozing frozen ground—dumping rock with a bang—you never worry! Hydro-Spring gentles trouble-causing forces by two-thirds or more—practically eliminates hydraulic hose failures!



Complete line of attachments

Job-getting, money-making attachments built for specialized duty, provide tree-grubbing, boulder-bucking, log-loading performance available only from International Drott equipment! Grubber Blade attachment, used in place of the 4-In-1, is shown applying the tremendous force of pry-action break-out—to uproot a tough old oak tree. Other special attachments built to extend International Drott advantages to other fields include: Rock Forks, Skid-Grapples®, Bulldozer and Bullangledozer blades!

CHOOSE FROM

four 4-in-1 sizes

TRACTOR SIZE	4-IN-1 CAPACITY
TD-6.....	1-YARD
TD-9.....	1½-YARD
TD-14.....	2¼-YARD
TD-18.....	3-YARD

International Harvester Company, 180 N. Michigan Ave., Chicago 1, Ill.
Drott Manufacturing Corp., 3126 South 27th St., Milwaukee 15, Wis.

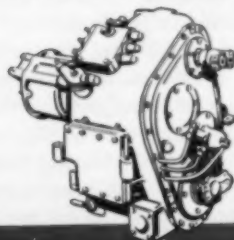


INTERNATIONAL DROTT®

ONLY
your International distributor
can give you 4-in-1 Performance
ON RUBBER!



NO-STOP POWER SHIFT



One lever makes all shifts forward and reverse under full throttle — no clutching, no stopping. Torque converter provides infinite speed ratios.

PAYLOADER® mobility

PLUS four-machine utility

The only rubber-tired tractor-shovels available with Drott 4-in-1 buckets

Now you get even more tractor-shovel performance when you buy a "PAYLOADER". Equipped with a Drott 4-in-1 bucket, your "PAYLOADER" can handle many jobs that other wheeled tractor-shovels can't touch . . . perform shovel, clamshell, scraper or bulldozer work that would otherwise require several separate machines.

With a Drott 4-in-1 on a "PAYLOADER" you also get:

MOBILITY — quick-to-job travel over streets or highways under its own power . . . ability to work on or off paved surfaces.

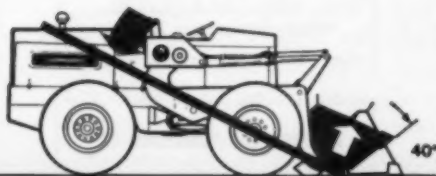
MANEUVERABILITY — easy operation and fast

loading cycles because of responsive rear-wheel power steering, "no-stop" finger-tip power shifting, dependable 4-wheel power brakes.

BALANCE AND STABILITY — long wheelbase . . . hydraulic load-shock-absorber . . . low, close bucket-carry position, all contribute to the easier riding qualities, the higher carrying speeds and the unusual balance that are outstanding "PAYLOADER" operating advantages.

TRACTION AND DIGGING POWER — exclusive power-transfer differentials, planetary final drives and the powerful pry-out bucket digging action help these "PAYLOADER" units to outperform other tractor-shovels of comparable size. Your International Distributor is anxious to demonstrate what these "PAYLOADER" tractor-shovels with a Drott 4-in-1 bucket can do for you. Ask him about the "PAYLOADER" Deferred Payment Plan.

PRY-OUT DIGGING ACTION



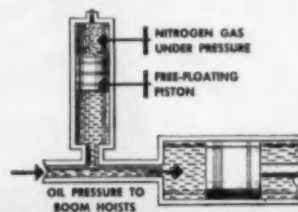
Exclusive "PAYLOADER" bucket action combines a powerful prying force over "break-out" pads, with 40° bucket tip-back at ground level to get heaped loads into bucket quickly and easily.

POWER-TRANSFER DIFFERENTIALS



These special differentials give better traction under all conditions — automatically deliver 25% more power to the wheels with the better traction.

LOAD SHOCK ABSORBER



This important device is a part of the hydraulic system. It cushions the loaded bucket, smooths the ride, permits faster carrying speeds, reduces spillage, boosts production.

All three sizes of 4-wheel-drive "PAYLOADER" tractor-shovels, models HU, HH and HO, are available with Drott 4-in-1 buckets, sizes 1, 1½ and 2¼ cu. yd. respectively.



PAYLOADER®

MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY



THE FRANK G. HOUGH CO.

735 Sunnyside Ave., Libertyville, Ill.

Send full data on 4-wheel-drive "PAYLOADER" model
() with Drott 4-in-1 bucket to:

Name _____

Title _____

Company _____

Street _____

City _____

State _____

90



PLAIN PRIMACORD

Textile-covered, flexible and resilient. Suitable for surface trunk lines and shallow holes where tensile strength and resistance to abrasion and cutting are not required. Tensile strength 125 lbs. 1000-ft. spool 17 lbs.



REINFORCED PRIMACORD

Textile reinforced, tough, resilient, flexible. Recommended for surface trunk lines and deep holes where normal strength and resistance to abrasion and cutting are needed. Tensile strength 160 lbs. 1000-ft. spool 18 lbs.



PLASTIC WIRE COUNTERED PRIMACORD

Armored with wire and covered with plastic material. Recommended for use in deep, ragged holes or with metal or fibre explosives containers, where strength and resistance to abrasion and cutting are essential. Tensile strength 300 lbs. 1000-ft. spool 33 lbs.

BLASTERS AGREE that thunderstorms, high tension lines, power cables — even two-way radios — can be sources of stray electrical currents . . . and that these can cause premature shots under certain conditions.

The best safeguard against such hazards is to use a detonating agent which is insensitive to stray electrical currents.

In primary blasting, use Primacord as the detonating agent in each hole and also as the trunk lines to connect all holes so that they will fire in proper rotation. The entire blast can be detonated from one point on the trunk line — with fuse and cap or electric blasting cap. This final hook-up is made only when all is in readiness and when it is safe to fire.

In secondary blasting, use Detacord to prime each charge and to connect all charges, detonating it in the same way.

If your holes are primed with fuse and cap, connect the fuses with Quarrycord.

For more information, see your explosives supplier or write to

THE ENSIGN-BICKFORD COMPANY

Simsbury, Connecticut . Since 1836


Primacord and Detacord Detonating Fuse, Ignitacord,[®] Quarrycord,[®] Safety Fuse, Pyrotechnical Devices and Blasting Accessories

When
thunderstorms
threaten — or wherever
stray electrical currents
are suspected

Play it Safe!

USE

PRIMACORD[®] • DETACORD[®] • QUARRYCORD[®]




PLASTIC REINFORCED PRIMACORD

Covered with tough plastic material, not affected by high Summer heat or Winter cold. Waterproof — resistant to acids commonly encountered. Use for extremely deep holes, river crossings, field shots that must stand for long periods of time and in other wet conditions. Tensile strength 275 lbs. 1000-ft. spool 22 lbs.



DETACORD

Smaller (and less powerful) than Primacord. Core of PETN is textile-reinforced and wax finished. Identified by light brown surface with cross windings of red yarn forming an "X" pattern. Resilient, flexible. An economical detonating fuse for use in secondary blasting, long hole underground blasting and pipe-line ditching. Not recommended for primary blasting. Tensile strength 100 lbs. 500-ft spool weighs 8 lbs.; 1000-ft spool weighs 16 lbs.



QUARRYCORD

Used to connect and ignite safety fuse in secondary blasting. Burns progressively with an external flame at the zone of burning — about one foot per second. Flexible — not affected by stray currents. 500 ft. spools. Quarrycord Connectors — 100 in a box.

P-4



JUNE, 1957

IVAN A. GIVEN, EDITOR

New Opportunity

JULY 1 is the date for the start of a new campaign to reduce the toll of injuries and fatalities resulting from falls of roof, ribs and face. The goal is a 50% reduction in the year ending June 30, 1958. Aside from keeping more men healthy and alive, the rewards include National Safety Council awards to mines for a 50% reduction in injury frequency or a perfect record; to supervisors for no injuries during the year with the proviso that they must actively participate; to union locals at mines achieving the necessary reduction; and to members of the safety committee at award-winning mines.

This is a cause that each and every man in the industry can support. If the problem of falls can be solved, the industry will have reached a point where it can truly claim that it is approaching the irreducible minimum in injuries and fatalities. The key item is roof support—enough to do the job, installed at the right time, and placed so it will do the most good.

Model Selling

ELMIRA, N. Y., widely famed as Mark Twain's adopted home and the glider capital of the world, also is becoming known as a model for anthracite selling. All but one of its 13 schools, Elmira College, numerous commercial buildings and a fair percentage of its 75 industrial concerns have converted to anthracite and modern burning equipment in the past five years or so. One result has been an outstanding smoke abatement program "without penalties" which has aroused community interest as far distant as California. Also, school-board officials, architects, consulting engineers and heating contractors from many parts of the anthracite territory have converged on the city to learn the facts behind its swing to hard coal.

What makes Elmira (pop. 52,500) a model

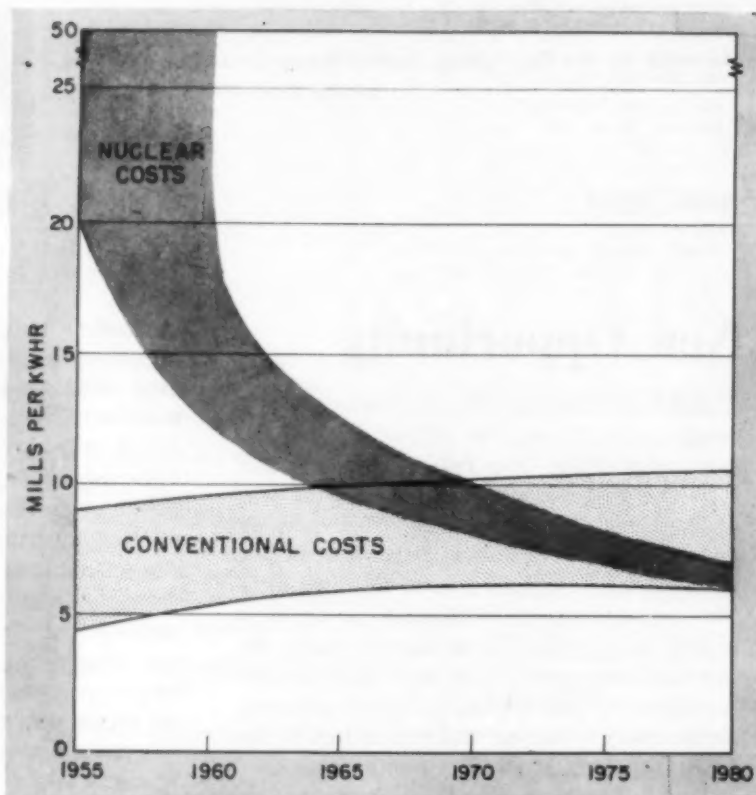
for anthracite selling? It is not among the biggest outlets for hard coal—in fact it is not even in the top 15 city markets. The gas rate is lower than in other towns within a 100-mile radius. The answer is in the merchandising leadership of J. John Hassett Jr. and Douglas Breed, of the Elmira Coal Co., who have virtually single-handedly sold a major part of the city on the idea that anthracite is not an out-dated fuel; that it is not only clean and in dependable supply but that it has definite cost- and labor-saving advantages when burned in modern equipment. All coal producers and dealers might well look to cities like Elmira for concrete clues on how to expand their space-heating markets.

Sure Knowledge

DO I KNOW, for sure, whether my bolting pattern is correct, my unit is regularly producing the tonnage it should, I am using supplies efficiently? The preceding question might be lengthened indefinitely by adding every other operation involved in mining, preparation and services. The need for sure knowledge grows daily with the trend to more and more-expensive machinery and to fewer and better paid men. That increasing need is responsible, among other things, for the rise in the number of standards departments devoted to supplying accurate information on what men and equipment may reasonably be expected to do.

But every man has to be his own standards department also—if for no other reason than because knowledge begets skill and increasing skill brings advancement to more-rewarding positions. When a conscious attempt is made to arrive at realistic standards, whether in bolting, unit tonnage or supply cost, the required study automatically points the way to where improvements can be made. Moral: Be your own standards-setter. It's good for you, your company and your industry.

The Challenge of Nuclear Power . . .



BY 1970, electric power from large nuclear and conventional plants (assuming load factors of 70 to 80%) should become competitive in the upper cost range of 8 to 10 mills per kwhr, as shown by AEC estimates. The extent of competition will depend on how well coal prepares now to meet the challenge . . .

Planning for Competitive

Atomic schizophrenia—a split between immediate overseas, and long-range domestic nuclear power needs—is moving the Nation toward a speed-up of its atomic power program. Coal's job: adopt a more realistic approach to the entire nuclear power question

By W. A. RALEIGH, JR.
Assistant Editor, COAL AGE

COAL MUST FACE UP TO THE PROSPECT that nuclear power could become competitive or nearly competitive with steam power after 1970, at least with coal plants producing steam in the upper cost range of 8 to 10 mills per kwhr.

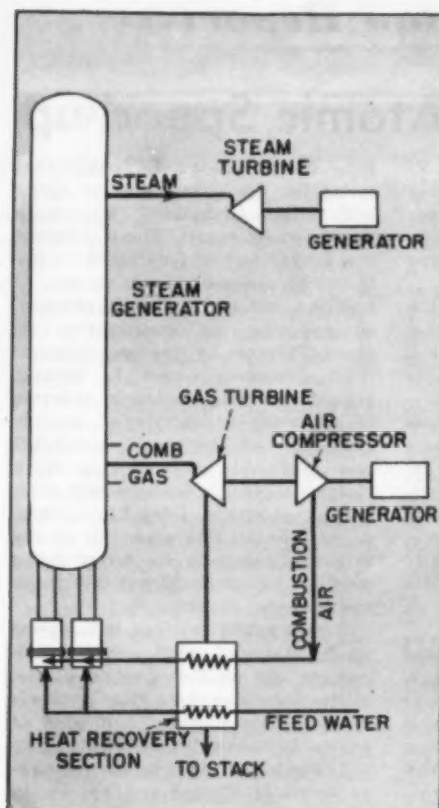
Atomic energy analysts (p 56) underscored that prospect in a symposium on the future economics of nuclear power at the 1957 Nuclear Congress held March 14 in Philadelphia, Pa.

That prospect, in all probability, will also be the outcome for coal of the battle raging in Washington over the Nation's atomic power development policy (p 56).

Facing up now to the prospect of

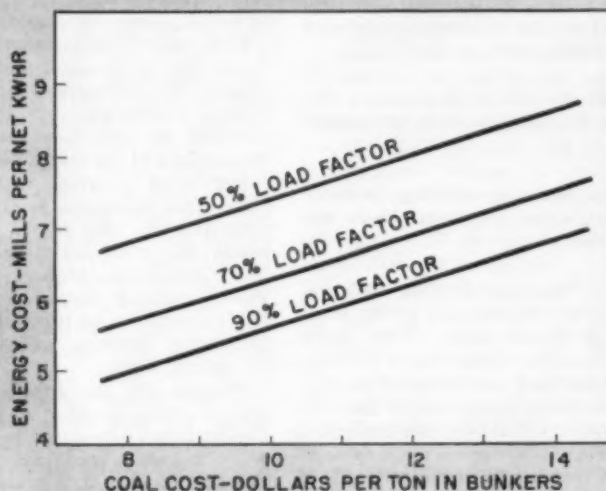
competitive nuclear power is no easy task. The period after 1970 seems too remote for present-day concern, particularly in view of the huge growth in coal power needs anticipated during the next two decades. As pointed out in *Coal Age*, January, 1956, p 54:

"If the country's electric power needs are to be met in 1975, annual coal use for power by that time must climb to 430 million tons, or more than three times current (1955)



COST OF ENERGY FROM PROJECTED COAL-FIRED STEAM ELECTRIC PLANT OF 1980

BASED ON 1955 DOLLARS



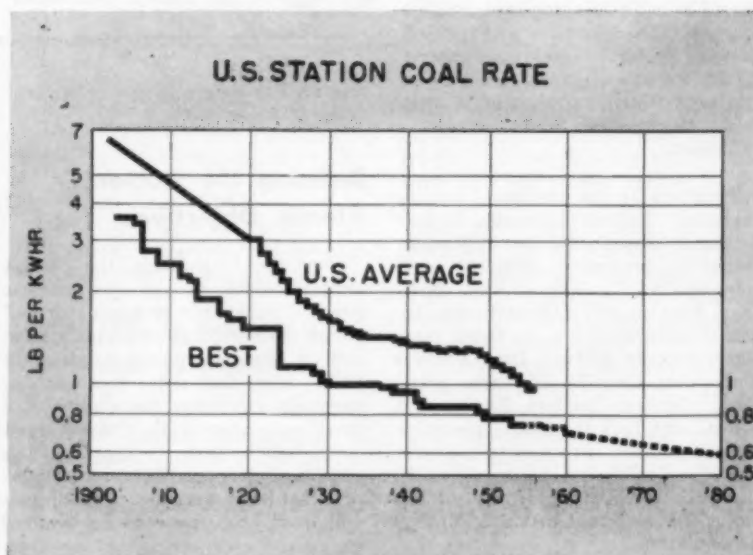
... ONE ANSWER in a proposed industry-action program (p 58) is to step up gas turbine and gasification research. The possible results by 1980, as seen by the Philadelphia Electric Co.: a 750,000-kw-coal-fired plant . . . incorporating a gas turbine in the cycle (above-left) . . . producing electricity at 5 to 8 mills per net kwhr (above-right) . . . and using 0.6 lb of coal per net kwhr (below). Today's large plants (up to 450,000 kw) average 8 to 9 mills in kwhr-cost.

Nuclear Power

usage." Actually in the light of developments since that time, the total may be much higher. But, as also pointed out in the same article:

"The critical period for evaluation of nuclear power [as a competitor] should come during 1965 to 1970. And what coal and other fossil-fuel industries do between now and then will be the biggest factor in determining if and how far nuclear power spreads after 1970."

Since these statements were made 18 mo ago, competitive nuclear power is in fact no closer because of major advances in nuclear technology. But the past 18 mo has changed the picture to this extent: The Nation is moving with grim determination toward a strengthening of its immediate and long range objectives for nuclear power. As these objectives appear to be shaping up, they chart a course which will not settle for less than put-



13-Man Team Weighs Atomic Power Future

WEIGHING the latest prospects for economic nuclear power, a 13-man team of representatives from industry, government and research met at the 1957 Nuclear Congress and sought to answer these questions:

What are the commercial prospects for nuclear power in the U. S.?

Is the present U. S. program consistent with future needs for atomic power?

If not, what type of program would be best suited to U. S. needs and opportunities?

While opinions differed, all virtually agreed on this one point: there is no pat answer to any of the above questions—and there could be none where so many uncertainties and imponderables are involved. In this article, however, *Coal Age* has attempted to sift opinions for common denominators that indicate definite trends of importance to coal. To cross-check these trends, McGraw-Hill's Washington Bureau was asked to prepare an on-the-spot roundup (right) on the status and outlook for atomic legislation.

Speakers at the morning session of the nuclear economics symposium were: Marling J. Ankeny, director, USBM; Karl Mayer, consultant, Stanford Research Institute; James H. Harlow, chief mechanical engineer, Philadelphia Electric Co.; Louis H. Roddis Jr., deputy director, div. of Reactor Development, Atomic Energy Commission; and Frank Weaver, Federal Power Commission. G. Clark Thompson, director, Div. of Business Practices, National Industrial Conference Board, acted as chairman.

Panelists at the afternoon session included: Robert LeBaron, Robert LeBaron Associates, Inc.; Manson Benedict, professor, chemical engineering, M.I.T.; Marvin Fox, chairman, Reactor Dept., Brookhaven National Laboratory; R. L. Doan, manager, Atomic Energy Div., Phillips Petroleum Co.; W. H. Zinn, president, General Nuclear Engineering Corp.; and Jack H. Busby, executive vice president, Pennsylvania Power & Light Co. Session chairman was W. Kenneth Davis, director, div. of Reactor Development, Atomic Energy Commission.

Washington Report

Atomic Speed-up

THE CURRENT CONGRESSIONAL SEARCH for a national atomic power development policy has produced substantial agreement on one point: There must be an acceleration of atomic-power development.

Both the administration and the Democrats who control the powerful committees in Congress believe this. Hence, before the year is out—or certainly by this time next year—the outlines of the stepped-up atomic power plant program will become clear. This expansion is coming despite the fact that higher cost estimates for commercial-size atomic power plants mean higher cost atomic power, making them economically less competitive, on the average, with generating facilities using coal, oil or falling water.

Reasons for the drive to expand atomic power production are many. Public power advocates in Congress want a federal program. There is pressure to keep U. S. technology up with or ahead of that of other countries. Utility officials are also anxious to get a foothold in the field to keep up with what they believe is an important power source of the future. And builders of atomic power equipment are pushing for markets, both in the U. S. and abroad. Basically politicians believe also that since we brought on the atomic bomb we also have to lead in peaceful uses.

Democrats charged last year that private industry was not moving fast enough in building atomic power plants. They got behind the bill by

Sen. Albert Gore (D-Tenn.) that called for the government to spend \$400 million in building large-scale atomic power plants. The bill passed the Senate but was defeated in the House by opposition from the administration, industry and coal interests. In opposing the construction of atomic plants by the government, AEC Chairman Lewis L. Strauss argued that this country's program of exploring a variety of reactor types to find the most economical was preferable to indulging in a "kilowatt race" with power-short foreign countries. Gore has reintroduced this bill this year. But all the evidence points to its terms being modified before it reaches the House and Senate floors.

Recent public hearings in Congress on the status of atomic power development and on the question of liability insurance for atomic power projects have clarified a number of points, including the following:

1. The urgent need for atomic power exists in Europe and not in the U. S.

2. This country's program must be geared to the urgent need abroad.

3. Atomic power will not be competitive here with conventional fuel for a good many years but it may already be competitive with these fuels in some European countries where power costs are higher.

Added to the foregoing is the admission by Strauss that the U. S. development program needs speeding up. A couple of months ago he re-

ting nuclear power in the upper cost range of steam power.

Defining the Nation's Atomic Objectives

Over the long range, the Nation must conduct a vigorous nuclear power development program that will permit atomic energy to supply a large part of domestic power needs after 1980. After that date, fuel analysts generally agree that the country will need more power than fossil fuels alone will be able to supply. Their concern is deepened by the real prospect that large quantities of fossil fuels will most likely have to be diverted to premium or specialized uses for

which there are virtually no substitutes.

Of more immediate concern, the Nation must maintain world leadership in nuclear power research and development. This is vital to making nuclear electric power an effective part of overall U. S. foreign policy which is dedicated to aid all countries of the free world. Most of these countries are, or will be, short of conventional fuels to supply their growing energy needs.

Is the Present Program Adequate?

The present atomic power development program is undergoing a period

Coming

requested industry to come forward with additional proposals for reactor projects. He specified that these must be projects to be completed by June 30, 1962, and that they should include at least two specific types. These were a natural uranium reactor and an aqueous homogeneous reactor. Strauss gave industry until the end of this year to meet this need. If companies don't respond, he will ask Congress for funds to build the needed reactors at AEC installations.

With agreement on the need for more speed in building atomic power plants, the only question remaining is how it should be done. The Gore bill is in effect a federal crash program. But it does not appear to have the solid Democratic support it had last year. Rep. Carl T. Durham, (D-N.C.), chairman, Joint Committee on Atomic Energy, says he doesn't think we need a crash program. But he does call for an accelerated domestic reactor program.

Rep. Sterling Cole (R-N.Y.), has introduced an atomic energy bill, one feature of which also is aimed at speeding development of atomic power for foreign use. Cole proposed spending up to \$100 million by Jan. 1, 1963, in subsidizing half the incremental cost of atomic power reactors overseas. The incremental cost would be the difference between the cost of similar size conventional fuel and atomic power plants.

Although not incorporated in his bill, Cole suggests that the same help should be extended for domestic re-

actor projects. Cole's suggestion is directly related to the fact that the recent hearings disclosed that costs for these "first generation" atomic power plants are far higher than originally estimated. On a number of large projects they are running 20% to 40% above first estimates. How these increased construction costs will be reflected in higher power costs has not been estimated in all cases. But to cite one example, the Yankee Atomic Electric Co. group reports that estimated power costs on its project have risen from first estimates of 10 to 12 mills per kwhr to 12 to 14 mills.

AEC's Reactor Div. Chief, Kenneth W. Davis, now sees atomic power costs running something like this: Plants that will go into service in 1957 through 1959 will achieve power costs of 20 to 50 mills per kwhr. From 1960 to 1964, when the first true industrial atomic power plants will come into operation, power costs will range from 10 to 13 mills per kwhr. Capital costs will run about \$300 to \$400 per kw of capacity compared with \$115 to \$180 per kw for conventional fuel plants.

In 1965 to 1967, capital costs will become more nearly competitive with conventional plants and power costs will range from 9 to 11 mills. By 1980, Davis estimates, atomic power costs will be down to about 6 to 7 mills. Davis also estimates total capacity of atomic power installed by 1980 in the U. S. at 227.2 million kw, or 32.5% of the country's total generating capacity.

Besides costs, there is another major hurdle to be overcome in the domestic program. This is the matter of liability insurance. All sides in this issue have agreed on the need for

federal indemnity insurance over and above the \$60 million the private insurance industry can provide. Sen. Clinton P. Anderson (D-N.M.) has introduced a bill under which the government would provide this insurance up to \$500 million on all atomic power projects.

The need for this insurance is so urgent that this year General Electric Vice-President Francis McCune told the joint committee that if the insurance were not forthcoming by the end of this session his company (1) would withdraw from its joint venture with Commonwealth Edison Co., Chicago, to build the Dresden atomic power station, (2) would recommend cancelling the project, and (3) would not participate in similar projects until suitable indemnity legislation was provided.

Some Democrats are inclined to regard the McCune statement, plus the increased costs of atomic power projects as strong arguments in favor of a federal atomic reactor program. Some Congressional sources also report the possibility of bargains being struck: support for indemnity legislation and further subsidies for private industry atomic projects in return for support for some form of federal reactor construction.

What it all adds up to is probably more atomic power plants both here and abroad, and more federal money to help with these plants. The argument for building abroad also included the contention that this will provide invaluable experience for the domestic program. The outlook thus is good for a closely coordinated domestic and foreign program of greater intensity than exists at present.—*McGraw-Hill Washington Bureau*

of reevaluation to determine whether or not it is properly calibrated to serve the Nation's best interests, domestically and internationally, as defined above.

The reevaluation does not necessarily mean that the present program has been inadequate or unsuccessful.

It does not necessarily mean that there will be a large-scale acceleration of the present program, or an all-out reorientation of policy to permit government subsidy for the construction of big nuclear power plants.

But the reevaluation does mean that Congress is determined to maintain a speed of development adequate to the national interest. Government-industry relationships under the present program are being closely examined.

If it is found that industry cannot maintain a tempo of development consistent with national objectives, the federal government will most certainly take up the slack.

Two factors discussed below have catalyzed a reevaluation of the Nation's atomic energy program.

Factor No. 1: Greater Awareness of Problems

Within the past 2 yr, the initial optimism for early development of cheap nuclear power has been replaced by stark realization of the vast engineering problems still to be solved—problems concerning waste disposal, recycling of fuel, safety, insurance,

etc. No decisions have yet been reached on the best or most efficient type of reactor. There is still no firm basis for determining nuclear power costs.

But the imponderables of today should not obscure the probable realities of tomorrow. As put at the 1957 Nuclear Congress by Louis H. Roddis Jr., AEC deputy director of reactor development:

"This is a period of some discouragement with respect to the cost of building and operating power reactors. After the excessive optimism of 2 or 3 yr ago, we are at grips with the hard realities of developing real nuclear power plants. This does not turn out to be an easy task. There are many difficulties and the way ahead is not

wholly clear.

"However, just as it was unfortunate to have had this over-optimism 2 or 3 yr ago about 4- and 5-mill nuclear power, it would be equally unfortunate to let the present frustrating but not unexpected engineering difficulties lead us to undue pessimism about the future of nuclear power in the United States.

"Some years from now, we believe that nuclear plants will have higher capacities than the present conservative designs permit and that they will be built more simply and more cheaply. We believe also that we will find ways of making fuel elements of long life cheaply and with adequate reliability. Some of this, perhaps the major part, will be accomplished simply by dogged engineering development work. The rest will come from the new ideas and inventiveness which have ever characterized the advance of technology in the United States."

Thus, time is the most important single factor in solving present-day nuclear problems. But those charged with the responsibility for the Nation's atomic power program must be assured that there are no unnecessary delays in development because of lack of funds. Some government and industry analysts feel that the Nation is trying to push faster than is possible and that funds alone will not solve engineering problems. Others are convinced that more funds are the answer. And they claim that these funds will have to come from the Federal Government because of the magnitude of investment needed and the fact that the abnormal uncertainties attached to that investment are too great for private industry.

Factor No. 2: Pressing Foreign Policy Needs

The critical need for energy in Europe and other world areas has focused attention on overseas atomic energy programs. The organization this year of Euratom, the rapid advance of Britain's nuclear power program, and the alleged superiority of Soviet Russia's atomic energy development—all these have combined to pose the question: Is the U. S. geared to maintain world leadership in the atomic race, consistent with its economic, political and military leadership?

Concern is expressed that the Nation's relatively huge supply of fossil fuels, is, paradoxically, a handicap. In other words, the U. S. is so well endowed with conventional energy sources that there is always the pitfall of complacency—the failure to do

something adequate for overseas countries because there is not the compelling necessity domestically.

Such arguments favor the integration of U. S. atomic power policy with total U. S. foreign policy, not only for defense reasons but also for economic and world diplomacy objectives. The development of practical nuclear reactors for fuel-short or high-cost fuel areas overseas could become a powerful means of winning friends and of blocking another inroad for world communism, it is agreed.

This much seems quite clear: The U. S. must not confuse long-range needs for nuclear power at home with immediate needs abroad to further the cause of foreign policy. Here, too, it must be remembered that high-cost nuclear power abroad, 10-20 mills per kwhr, is no serious drawback. Many overseas countries are so destitute of energy that they will pay a premium price for it. Take, for example, what European countries now pay for imported coal (\$25 per ton) and also what Japan pays (\$35 per ton). The U. S. cannot ignore the energy needs of the world and still fight the battle of world diplomacy.

Atomic Schizophrenia: Possible Outcome

Because of the schizophrenia developing in U. S. domestic and international atomic power policy, many informed observers look for this outcome. Two separate programs may be set up, one to suit long-range domestic needs and the other to meet the exigencies of foreign policy. Naturally, however, it is not possible to separate both programs completely. Technological advances resulting from a stepped-up development of nuclear power reactors for overseas countries would certainly benefit a domestic atomic power program. And the eventual result of a twin program could be a shortening of the development time needed to bring the cost of nuclear power in the U. S. down to the upper cost range of steam power.

Speaking at the 1957 Nuclear Congress on the prospect of competitive nuclear power in the upper cost range, Dr. Karl Mayer, specialist in nuclear economics and consultant, Stanford Research Institute, said:

From the standpoint of a potential new competitor, the average cost of conventional power (6 to 7 mills per kwhr) is not so significant because nuclear power could compete first at higher-cost levels. Lowest cost power does not necessarily follow from highest thermal efficiency. A 1954 survey

of 187 large new steam plants in the U. S. showed, for example, that their generating costs averaged from about 8 to 9 mills per kwhr.

Thus, if nuclear costs drop to 8 to 10 mills per kwhr, nuclear power will offer substantial competition to large steam plants. And, Dr. Mayer added, net reactor fuel cost may change greatly with a change in any one component as, for example, chemical processing.

After an extensive analysis of the domestic and international atomic power picture, the Stanford Research Institute nuclear economist concluded:

1. In the decade ahead, the size of the market for nuclear power costing more than 10 mills per kwhr will be very small within the U. S. and large outside the U. S.

2. The economic growth of nuclear power will be very slow in the next 10 yr, although there will be substantial reductions in the cost of nuclear power.

3. If expected cost reductions in nuclear power materialize, there will be rapid growth in the nuclear power industry, even in the U. S.

4. Men of industry should prepare for rapid growth in nuclear power because of expanding activity in Europe during the 60's and in the U. S. during the 70's.

5. In the decades ahead, it is difficult to see how the market for power at 10 mills per kwhr could be satisfied without nuclear power.

What Coal Must Do

A more realistic adjustment to the prospect of competitive nuclear power is vital to coal because the Nation is moving toward a strengthening of its atomic power development program. No one knows the exact form that strengthening will take—and it may be a year or more before such is known. But informed expert opinion indicates that whatever the form, the result will be a firmer program dedicated to making nuclear power competitive or nearly competitive with steam power after 1970 in the upper cost-range of 8 to 10 mills per kwhr.

To make a more realistic adjustment, coal must adopt and maintain a realistic approach to the entire nuclear power question. For example, strong opposition to atomic legislation is necessary and certainly desirable where this legislation is obviously prejudicial to coal and to the national interest. But, opposing atomic legislation truly conceived in the Nation's best immediate and long-range interests will not stem the overpowering

tide of progress aimed at developing a major new source of energy.

Active acceptance of eventual nuclear power implies, first of all, the adoption NOW of an industry-action program geared specifically to that eventuality. If the industry waits until 1970, coal will have irretrievably lost 15 yr during which its competitive advantages could have been sharpened to the ultimate degree. As pointed out earlier, what coal and other fossil fuels do between now and 1970 will be the biggest factor in determining if and how far nuclear power spreads after 1970.

The 14-point industry-action program proposed in *Coal Age*, January, 1956, is reproduced on this page under the heading, "No Cause for Complacency." On most of the items covered in the first group of 9 points—applying to competition from oil and natural gas as well as to possible competition from nuclear fuel—coal is already making notable progress. But on most of the items in the second group of 5 points which apply more specifically to nuclear fuel, there is room for more action. And, in connection with the latter group, coal might pay particular attention to the following proposals:

1. Support a vigorous research and development program as vital to long-range domestic, and immediate overseas energy needs. Such support is the best insurance against large-scale government subsidy of nuclear power plants that could materialize later to fill the vacuum of development resulting from an adequate program now.

2. Step up gas turbine and gasification research. If coal could be gasified and piped economically from the mine for use in gas turbines at utility plants, a major blow will have been struck in warding off possible inroads by nuclear power into large, new coal-burning plants producing steam in the upper cost range.

Commenting at the 1957 Nuclear Congress on the prospects for gas-turbine use in steam electric power plants, J. H. Harlow, chief mechanical engineer, Philadelphia Electric Co., said:

It should be possible by 1980 to find a way to pass the products of coal burning through the gas turbine, or to remove harmful elements during gasification at the mines. These developments would probably permit the design of a fossil-fuel burning steam electric power plant having the following characteristics:

Unit size, 750,000 kw.

Steam temperature, 1,400 F.

Steam pressure, 7,000 psi.

Three stages of reheat by liquid

No Cause for Complacency

LACK OF PROOF that nuclear electric power can be made practical or economical is no cause for coal to "rest on its oars" (*Coal Age*, January, 1956, p 60). At one time television, jet aircraft, the transistor, nylon and numerous other items were strictly for the dreamers. Today, within a relatively short period of time, these dreams have mushroomed into commercial realities. Modern research and technology give no ground for the notion that the problems are insurmountable. Coal must therefore adopt an industry-action program geared realistically to the prospect that great progress in nuclear power development will be made during the next quarter-century. A general program, as applicable to potential competition from nuclear fuel as to actual competition from natural gas and oil, might include the following recommendations:

1. Make sure that production capacity is adequate to supply future demands.

2. Maintain or reduce production costs through operating efficiency and mechanization.

3. Improve merchandising methods for more effective selling of consumers on the merits of coal and coal-burning equipment.

4. Check constantly on existing, new or growing markets for opportunities to increase sales.

5. Provide reasonable wages to labor.

6. Reduce mine-to-market costs.

7. Campaign for fair treatment in state and national legislation.

8. Expand research to develop new or improved techniques on using marketing and producing coal.

9. Conduct a more aggressive industry-wide public relations program.

Where atomic energy, the "dark-horse" potential competitor is involved, there is added need for thought and action on these points:

1. New methods or substitutes for transporting coal must be developed, such as, overland pipelines, gasification, and the location of electric power and other industrial plants near mine sites. Atomic energy is virtually a "freightless fuel," thus giving nuclear power its greatest potential advantage.

2. The use of automatic systems for cutting, conveying and loading coal must be spread across the industry. Along with a new approach to the transport of coal, more mechanization and higher output per man-day can contribute most to the lowering of the delivered price of coal.

3. More research must be focused on ways that coal and atomic energy can serve each other. Power from nuclear reactors, for example, may eventually be the answer to economical conversion of coal to gas and liquid fuels.

4. The development of nuclear power must be accepted in the national interest. The Nation needs a supplementary heat source because of the expected growth in energy demands, the possible depletion in natural gas and oil supplies, and the existence of high-cost fuel areas and power shortages at home and abroad.

5. Government support of nuclear power research and development must be more accepted as vital to the atomic energy industry. This of course does not mean government subsidy or construction of uneconomic plants to compete for the sake of competition.

metal heating to 1,300 F, 1,250 F and 1,250, respectively.

Gas turbine in the cycle.

Coal rate 0.60 lb per net kw-hr.

1980-plant cost (1955 dollars), \$150 per kw with solid fuel; \$135 with gaseous fuel.

When using solid fuel, the 1980 plant cost shown above would be about 90% of the kw cost of the 1955 plant assuming, of course, that dollar value remains constant. In view of the projected increase in size to 750,000 kw (maximum size is now 450,000 kw), Mr. Harlow says that this

plant cost reduction does not seem to be out of line. And he adds: "The reduction of 10% in plant costs could be substantially enlarged on the basis of gaseous fuel made from coal at the mines. In such a situation, coal handling and storing facilities, pulverizers, ash hoppers and transporting equipment, all stack gas cleaning equipment and the supporting building could be eliminated. These items cost in the order of 15% of the total plant cost. In the case of a 750,000 kw unit this would represent from \$10 to \$15 million."



DRILL CONTROLS are mounted conveniently where operator can see cuttings. Dozer blade serves as front jack.

DeBardeleben

Versatile overburden drill that cuts its own road and high-lift shovel are key units in removing up to 50 ft of cover on thin Alabama seam.

VERSATILE DRILL mounted on wide-gage tractor with dozer blade cuts its own drill road. Unit also carries water in tank on blade for dust suppression.



LOCKING DEVICE (arrow) keeps bulldozer blade on chassis in position after drill is leveled.



HIGH-LIFT SHOVEL works around the clock removing up to 50 ft of cover to expose the 18-in Cobb seam.



TRACTOR SHOVEL skims off fine dirt on top of coal. Unit also is available to gather coal missed by loading shovel or to load 5-in rider seam.

Strips 18-in Seam

MINING AN 18-IN SEAM of coal to provide 250,000 tons of coal per year to a recently completed newsprint plant at Mobile, Ala., is the task of the DeBardeleben Coal Corp.'s new Waterside strip operation. Located on the west bank of the Black Warrior River on Bankhead Lake at the junction of Mulberry and Locust Forks, Waterside mine ships coal by barge down Alabama's Warrior-Tombigbee waterway to the doorstep of the International Paper Co. at Mobile. Efficient mining combined with low-cost water transportation makes it possible for DeBardeleben to undersell gas in its own backyard.

The development of Waterside presented some unusual problems. The coal reserves are in an area 18 mi from the nearest railroad and there are no good highways crossing the property. Existing bridges were not designed to support heavy trucks such as would be needed to haul heavy stripping equipment to the mine. But just across the Warrior River good roads were available. As a result, the company had to ferry equipment and material to the mine site. The company still ferries workers across the river.

De Bardeleben first built barge landings on each side of the river. A deck barge then was put in service to haul machines and materials across the river. The biggest and most difficult job was bringing in the P&H 1800 high-lift stripping shovel. This unit

was shipped by rail to Mobile where it was assembled on a Mississippi-River-type barge and made ready for the trip upstream to the mine. When the shovel arrived power was connected to it and after some minor assembly work the unit left the barge under its own power.

Offsetting the difficulty in getting machines and materials to the mine was the availability of an excellent natural barge slip bordering the property. Furthermore, since the property borders on Bankhead Lake, DeBardeleben also is not troubled with changing water levels or currents. Because of these advantages the company was able to install a low-cost barge-loading facility.

WHAT THE MINING CONDITIONS ARE

Mining is in the Cobb seam which has an average overall thickness of 28 in. A 5-in band of soft clay divides the seam into 18-in and 5-in layers. Only the thicker 18-in portion now is recovered; however, the company hopes to be able to skim off the 5-in layer of coal from time to time.

DeBardeleben expects to remove as much as 50 ft of cover on the thin seam and plans to handle an average of 40 ft of material. Friable shale makes up 30% of the overburden and 70% of it is laminated shale which sometimes grades into sandstone. The overburden is sometimes cut by 6-

to 8-in vertical mud seams which reduce the effectiveness of explosives.

DRILLING AND BLASTING

Two duties are performed by the two-man drill crew. The first is to locate the coal outcrop with a 3-in vertical auger drill mounted on a jeep. The second is to drill blastholes and load explosives where blasting is required.

As a rule it is not necessary to shoot the first-cut overburden. In the few cases where hard material is met, one row of holes on 18- to 20-ft centers at the back of the cut is sufficient. Akremite in the ratio of 1 lb to 10 cu yd of overburden is used to break the first-cut material.

Blastholes for the second and subsequent cuts are drilled on 20-ft centers in rows 18 ft apart. Two rows of holes are drilled in each cut and holes are staggered in the rows. As holes are sunk, the driller checks the cutting for hardness and type of rock. He also keeps a log which later serves as a guide in loading explosives. Diameter of blastholes is 7½ in and holes are drilled with a Hughes Tricone bit. An average of 4,000 ft of hole is drilled per bit.

Holes are charged with 30-lb bags of Akremite and a special 12½-lb primer of du Pont 75% gelatin is placed in the middle of each charge. An average of 1 lb of Akremite is used for each 5 cu yd of overburden. Holes are connected with Primacord and at times MS connectors are used between holes. Because of the accumulation of water in holes blasting is done at the end of each shift.

A new Winter-Weiss 6T Porta-drill mounted on a wide-gage Caterpillar D6 tractor with a supercharger handles the drilling job. Features of the drill include a dozer blade that permits the machine to make its own road; a built-in water system for wetting the fine dust generated by the drill; a 26-ft kelly bar that also serves as a drill stem; and a 28-ft mast that can be raised or lowered in less than 2 min.

Two men operate the machine and drill an average of 600 ft per shift. They have drilled as much as 100 ft per hour in addition to loading explosives.

The drill transmission is driven through the power takeoff of the D6 tractor. The transmission in turn drives two 440-cfm Allis-Chalmers rotary air compressors supplying air for flushing cuttings out of the hole. DeBardeleben management reports that one of the compressors supplies enough air when holes are less than 60 ft deep and the second unit is used as a spare.

(Continued on next page)



TRUCK DESTINATION is 50-ton steel bin made from scrap railroad car. Coal is crushed before going to stockpile.



STOCKPILE BELT elevates crushed coal 46 ft to top of pile. Bulldozer spreads coal as pile builds up.

Ingenuity in design plus skillful use of materials add up

Drill dust is suppressed by water delivered under pressure to the air pipe going into the drill's kelly bar. A 100-gal water tank, mounted on top of the dozer blade, is the water source. A separate small rotary air compressor provides the compressed air to the tank where it forces the water to the drill.

UNCOVERING THE COAL

A P&H 1800 high-lift shovel, with a 65-ft boom, 44-ft stick and 7-yd dipper, works around the clock uncovering the 18-in seam of coal. The shovel moves an average of 10,000 cu yd in 24 hr and has moved as much as 15,000 cu yd in a day. It takes only 36 sec for the shovel to get a full dipper, swing 180 deg, unload and return for another.

The shovel is powered by 4,000-v electricity and electronic control is applied to all shovel operating motions. Thyratrons, or control rectifiers, are used in exciting the hoist Magnetorq, the fields of the swing generator and the fields of the crowd-propel generator.

The shovel cab housing the electrical equipment is pressurized. Intake air is drawn in through filters in the cab roof by a fan and clean air is passed through all of the electrical equipment requiring forced cooling. Air is exhausted through openings in the cab or revolving-frame deck.

LOADING AND HAULING

Before the 18-in of coal is loaded two 5-in layers of coal and clay are skimmed off by a Caterpillar 977 Traxcavator. The company hopes to



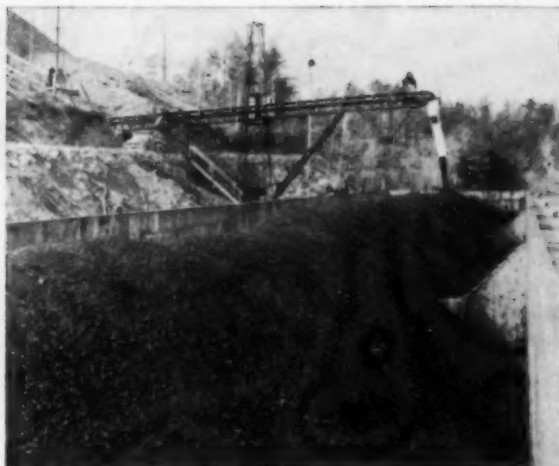
RECOVERY TUNNEL under 20,000-ton stockpile is made from 10x12-in by 14-ft treated timbers. Free running coal feeds onto belt by gravity.

be able to recover part of the 5-in layer of coal in the future with the tractor shovel. Final cleaning of the coal is done by two ground men who also shovel up any loose coal missed by the coal shovel.

Coal is loaded into Dart 25-ton semi-trailer coal haulers by a P&H 655A diesel equipped with a 2-cu yd Esco coal-loading dipper. Two of the coal trucks are able to haul a shift's output and a third unit is maintained as a spare. The company will have 5 yr of work where the haul will not be more than 1½ mi. When this block is recovered, the company will move the barge-loading facilities upstream on Mulberry Fork to another natural barge slip.

STOCKPILING AND BARGE LOADING

Coal haulers drop coal into a steel hopper made from a scrap railroad car. This low-cost storage facility was made by removing the two wheel trucks from the car and providing steel supports on a concrete foundation. Under each car door there is a Barber Greene car unloader that discharges coal into an Eagle Iron Works double-roll crusher. The crushed coal drops onto a 30-in belt conveyor made up of Continental Gin idlers on a frame and support built by Birmingham Steel Buildings. Coal is elevated 46 ft to the top of the stockpile where 20,000 tons are now stored



LOW-COST barge loading facility was made by extending recovery belt coming from stockpile and adding movable chute at discharge end to distribute coal in barge. Coal is fed to barge at the rate of 700 tph. One man handles loading.

to low-cost coal handling at barge-loading site



PROSPECTING of outcrop ahead of stripping is done with this unit.



SAMPLE CRUSHING is done on the spot after sample can is filled.

and where room is available for storing 50,000 tons.

Coal from the bottom of the stockpile passes by gravity through two feed gates located under the center of the pile and drops onto a 42-in belt that leads to the barge-loading chute. Since only 8% of the coal is smaller than $\frac{3}{4}$ in and therefore flows freely, it is not necessary to use feeders under the stockpile.

A tunnel to the center of the stockpile was made by first digging a trench and then lining it with treated timber. The rock above the end of the trench was funneled out so that the coal would run freely to the feed gates over the belt.

The 100-ft trench was converted

into a tunnel with heavy Osmose treated timber. The roof was made of 10x12-in by 14-ft timbers set skin to skin. These in turn are supported by 10x12-ft beams held up by 10x12's on 2-ft centers.

Coal is delivered to barges at the rate of 700 tph through a movable chute attached to the end of the belt. Starting and stopping of the belt, positioning of the loading chute and operation of the barge hoist are controlled from a central tower near the end of the belt.

Regular sampling of the coal is an important part of DeBardeleben's Water-side operation. Sampling starts at the stockpiling belt where a sample is taken from the belt every 30 min.

This coal is crushed on the spot and split into two portions in the ratio of 9 to 1. The smaller portion is re-crushed and the resulting smaller split is sent to the company's laboratory at Empire for analysis.

Coal also is sampled on the belt as it flows to the barge. Every 20 min the boom operator punches a timeclock, stops the belt and takes a full-width cut from the belt. A special device permits the boom man to make the cut in the same manner each time. As a shovel-like scoop mounted overhead on a steel frame is pushed across the loaded belt it takes a sample of coal ahead of it and discharges it into a chute. A pickup truck parked under the chute receives a total of 1,500-lb sample from each barge. This is run through the crusher three times and the resultant is put in a sealed metal container and shipped to the laboratory.

Only one barge is placed at the loading site. It is moved past the loading end of the loading chute by a wire rope attached to an old Brown Fayro mine hoist. The discharge chute is moved back and forth across the barge by a 1½-hp motor operating a rope drum through a speed reducer.

A loaded barge is towed 395 mi to the International Paper Co., at Mobile, Ala., where it is unloaded. The empty barge then is reloaded with iron ore from South America and hauled upstream to Birmingham where it is unloaded for delivery to Tennessee Coal & Iron's steel mills. After being unloaded, the barge is returned to Waterside for filling with coal again. It takes a week for a barge to complete the cycle.

38 Ways to Prevent Motor Failures

WHY MOTORS FAIL and how to guard against such failures is the subject of discussion of electric-motor maintenance. The thirty-eight points are offered with the idea of assisting any man who has anything to do with maintaining electric motors.

No attempt is made to outline a system for inspections or preventive maintenance. However, a well-organized program should be a part of any maintenance setup. A complete record of inspections and good preventive maintenance save time and money.



Keep motors clean.



Moisture and spray oil are harmful.

1. Dust on housings and windings reduce heat dissipation.

Fine pulverized coal and sand act as a blanket, confining heat until it can reach temperatures harmful to the insulation. Dust also plugs ventilation spaces, hampering further cooling. Clean motors in the course of regular inspection. Wipe the housing and use a blower to remove the dust from the windings. Take care not to use over 45 lb of pressure. A hand bellows can be used but a vacuum unit does a better job of cleaning windings.

2. Dust acts both as an abrasive and as an insulator on slip rings, commutators and brushes.

Since it is an abrasive, dust increases wear on slip rings, commutators and brushes. As an insulator, it decreases the amount of current flow at the point of contact of brush and commutator or slip ring. Wipe off slip rings and commutators. Check brushes for wear and make sure that brush-holders are free of dust.

3. Dust shortens the life of bearings.

Once inside bearings dust can be as harmful as a file to highly polished surfaces. To keep dust out of bearings, see that oil filler caps are always closed and that dust seals and gaskets are in good condition. If they are worn or rotten, as they may become in time, remember that seals are much easier to replace and cheaper than burned out bearings.

4. Dust in windings acts as a sponge in soaking up harmful fluids.

Dust poses an even greater threat to the life of an electric motor if allowed to fill the open spaces in windings. It will absorb oil and moisture which will destroy the insulation. Periodic cleaning by blower or vacuum is necessary to prevent the sponge-like action of dust in motors.

5. Moisture in motors destroys insulation.

Every effort should be made to keep water in liquid form out of motors. Motors containing moisture should be dried out before harmful effects to insulation take place. Methods of drying motors are as follows: bake ovens, induced current in windings, forced hot air through windings and by covering the motor and supplying heat by light bulbs.

6. Low insulation resistance readings indicate possible insulation breakdown.

Moisture, carbon and copper dust in cracks of windings furnish a path for current to flow. This is responsible for low insulation resistance readings. If the motor is allowed to stay in operation it will fail, causing lost production time and a high repair cost. Take the motor out of service, clean, dip in insulating paint and bake. Then place motor back in service.

7. Stray oil is harmful to motors.

Oil is strictly poison to electric motors. Good commutation is impossible when oil covers a commutator or slip rings. The faces of brushes become glazed causing harmful sparking. Oil also deteriorates the mica insulation between bars. Oil-soaked windings will cause burn-outs. Motors should be cleaned with a nonflammable solvent such as carbon tetrachloride. Take care not to soak the windings with the solvent as it may soften the insulation. Dry the windings and apply an insulating varnish.

8. Non-turning oil rings cause bearing failure.

It is important that the oil rings are free and turning with the shaft. A lack of oil in the bearings will soon cause failure. Check oil rings for flaws. Oil should be

changed periodically. Flush out the reservoir and refill with clean oil. Never add oil to a motor while it is in operation.

9. Incorrect lubrication increases trouble and expense.

Oil is a must for good motor maintenance. Too often bearings receive an insufficient supply of oil or grease or the wrong grade and type. Don't guess at the grade and type of lubricant that bearings should have. No one thing is more sure to cause trouble and expense than incorrect lubrication. If uncertain as to what lubricants to use check with the manufacturer of the equipment or the company supplying the lubricants.

10. Over-greased antifriction bearings promote friction and heat.

The main purpose of grease in antifriction bearings is not to guard against friction but to keep the steel rolling elements and races free from corrosion. Always keep in mind that the effective film of the lubricant is microscopically thin. Too much grease reduces heat dissipation and actually may increase friction within the bearing.

11. Misalignment or off-level motors cause broken shafts, burned-out bearings and overloaded motors.

Excessive temperatures indicate overloaded bearings or overloaded motors. Often it's possible to loosen the mounting bolts of the motor and position it while the motor is in operation to bring it to proper alignment. Motors that are off-level can be corrected by placing shims under the motor legs until the unit is in line.

12. Weak bedplates and foundations result in vibration.

Excessive vibration can be caused by errors in original installation of equipment, settlement of foundation, and weak bedplates for motors and machines. Check original installation for errors. Solidity of foundation can be checked by comparing with one where the motor does not vibrate. Eliminating all causes of vibration increases motor performance, raises production and reduces motor maintenance cost.

13. Misalignment of drive and driven machine contribute to vibration.

Often the source of vibration must be located by trial and error. Even when motor alignment is correct, vibration in the drive

or driven machine can be transmitted to the motor. Sometimes it is necessary to disconnect the motor from the driven machine to track down the source of vibration. If, after the motor has been disconnected, it runs smoothly, then the drive or driven machine must be checked for alignment.

14. Loose or faulty drive covers and guards can damage a motor.

Poorly constructed and improperly mounted covers and guards can get tangled in the drive, motor or driven machine and cause serious damage to one or all of the units. Proper covers and guards should be mounted on all power units for protection, not destruction.

15. Loose bolts and nuts on the motor, drive and driven machine increase the possibility of damage to the units.

Mounting bolts can work loose allowing units to pull loose from their bedplates or mountings. Expensive repair costs and lost production time caused by loose bolts are difficult to explain. Check and tighten all bolts and nuts at regular intervals.

16. Worn or loose bearings increase motor failure.

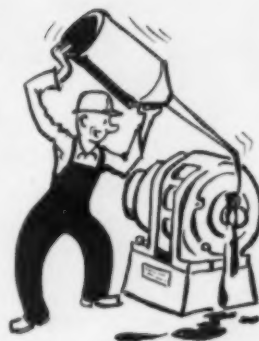
Misalignment, excessive oscillation and vibration result in worn or loose bearings. Excessive tension on belts and drive chains increase bearing wear. See that tension on belts and drive chains is proper. Change bearings when they show signs of wear. Bearing replacement is cheaper than motor repairs.

17. Rotors out-of-balance shake the life out of motors.

Inadequate balancing equipment and careless servicing can put rotors out of balance. Excessive vibration can shake motor parts and electrical connections loose, multiply frictional wear and damage insulation. Make sure that any rebuilt armature or rotor is balanced before putting it into service.

18. Increasing motor ratings to match load requirements results in motor failure.

Overload can be produced by increased efforts to obtain greater output from a machine. Motor ratings and load requirements should match reasonably closely. Discourage



Don't over-oil motors.



Keep bolts and nuts tight.



Check bearings often.



Unbalanced rotors shorten life.

efforts to increase output to the point where equipment is mistreated. Time spent with equipment while in operation will assure proper treatment.

19. Inadequate motor controls increase chances of overload.

Increased motor repair cost is the penalty paid for operating motors with inadequate controls. The controls should be equipped with overload protection, such as, thermal elements that operate overload relays and fuses of the proper rating. Controls with the required number of points for starting motors on resistance will prevent flashover and possible burnouts.



Don't over work motors.

20. Inadequate wiring contributes to motor trouble.

Insufficient carrying capacity and inadequate insulation are factors to guard against on all wiring installations. Make sure that the loads have been correctly estimated and correct wire size installed. Don't permit jerry work or short cuts on any installation. Make sure that wiring is well insulated.



Incorrect connections mean trouble.

21. Exposed motor leads are easily damaged.

Exposed motor leads are subject to being saturated with oil, grease or moisture. They can be damaged or pulled apart causing service interruptions. The pulling apart of a shunt lead could cause a motor to run away inflicting serious damage to the armature. Clean exposed leads. Check the insulation and make necessary repairs. Provide protection for the motor leads.



High voltage increases speed.

22. Incorrectly connected motors blow up.

Anything can happen to a motor that has not been properly connected. Use the wiring diagram on the nameplate of motor. If there is none on the plate the manufacturer will be glad to furnish it. Don't trust to memory. Be sure that all connections are right before voltage is applied to the motor. Also, make sure that each connection is tight and well insulated.



Low voltage decreases speed.

23. High or low voltage affects the performance of motors.

High voltage will increase the speed of motors, cause flashing or excessive sparking from brush to brush and, if the insulation is weak, will cause a short circuit, open circuit or a ground in the armature or



Keep brushes on neutral plane.

fields. Low voltage decreases the speed of motors, and increases the current, causing the motors to overheat. Overheating destroys the insulation. Periodic voltage checks, sufficient feeder capacity and proper location of substations will assure correct voltage at motor terminals.

24. Uneven wear of commutators, slip rings and brushes shortens motor life.

Commutators, slip rings and brushes are expected to wear, but wear can be minimized by preventing grooving, pitting and sparking at these points. Dust and oil should be wiped off the surfaces. First signs of rough or uneven wear should be corrected as soon as possible. This can be accomplished by turning or by using a stone on commutators and slip rings. Brushes worn unevenly should be trued or replaced. Always remember that smooth and even wear is slow wear.

25. Infrequent brush inspections increase chances of motor failure.

Neglected brushes can do no end of damage to motors. Check for brushes stuck in holders. Work them up and down several times to clean dust out. Replace brushes worn uneven, short or chipped. Make sure that brushes have the proper pressure. Frequent and regular brush inspection is the best way to improve performance.

26. Brushes off the neutral plane result in poor commutation.

Arcing of brushes, flashing from brush to brush and overheating are symptoms of brushes off neutral. Causes include shifting through accident, failure to set them properly in the first place or a loose set screw on rocker arm. Improper seating may keep brushes off neutral until they seat themselves. There is only one solution: set and keep brushes on the neutral plane.

27. High mica accelerates wear of commutator and brushes.

Commutator segments wear down to the mica, after which the copper wears faster than the mica, causing the mica to become higher. This induces brush chatter and arcing. In extreme cases a general roughness and heating of the commutator and flashing from brush to brush may occur. Commutators should be checked periodically. When high mica is evident it should be undercut and the commutator turned as soon as possible.

28. High ambient temperatures affect the lubricant, bearings and insulation.

Motor design and material are governed by the ambient temperature. When this temperature increases beyond its rating the lubricant deteriorates, bearings fail and insulation is destroyed. Check for proper ventilation and possible overload.

29. Infrequent current checks contribute to motor failure.

Over a period of time the motor, drive or driven machine may develop trouble that could overload the motor. Operating conditions also may change to increase the load. Periodic current checks should be made for a continuous record of the load.

30. Loose armature bands damage insulation.

The bands of armatures may, in time, become loose due to overheating and seasoning of the insulation. Loose bands shift during starting and stopping rubbing the insulation raw. This may cause an open, short or ground in the armature. Bands should be checked frequently for looseness.

31. Improper frame grounding of motors endangers personnel.

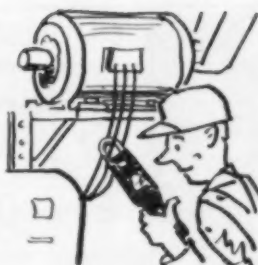
Good connection and correct wire size for framegrounding motors will protect personnel from electric shock. Ground connections should be checked frequently. Once a week is not too often.

32. Inadequate ventilation results in overheating.

Ventilation is of the utmost importance in motor installation. Overheating can be the result of poor ventilation. Sometimes it may be impossible to install motors where they will receive good ventilation. When this condition exists proper ventilation should be furnished by fans or blowers.

33. Overloaded motor bearings increase maintenance cost.

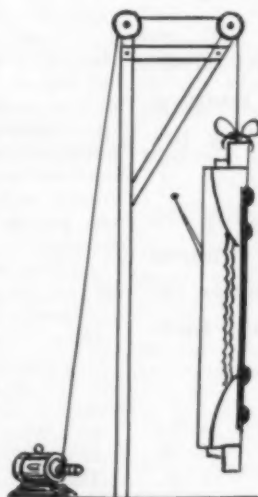
Ultimate failure of bearings and possible damage to the armature and fields are the results of overloaded motor bearings. Excessive tension in belts and drive chains are the main cause of bearing overload. Tension should be checked regularly. When new belts and chains are installed, proper tension and alignment are important.



Check motor load periodically.



Store motors in dry places.



Don't overload motors.



Keep records.

34. Spare motors stored in damp places become saturated.

Any motor exposed to dampness for a prolonged period of time absorbs enough moisture so that failure could result when placed in service. Motors should be stored in dry, clean places. A good storage place should be equipped with a heating device, such as, resistance or light bulbs. Always keep in mind that moisture is one of insulation's worst enemies.

35. Poor maintenance of controls invites trouble.

Motor controls, like all other equipment, must receive their share of maintenance. Fuses and overload heater-elements should be checked for proper rating. Contacts, wiring and connections, also cleanliness and the overall condition of the controls, are important points to check on regular inspections. Remember, motor performance depends on properly maintained controls.

36. Misapplication of motors multiplies maintenance cost.

Motors are designed for a wide range of jobs. However, best results are attained when the right motor is chosen for the specific application. Load requirements, voltage, speed, temperature rating, type of windings and enclosure are factors to consider. Misapplied motors will not perform properly and in most cases will fail.

37. Infrequent motor overhauls contribute to higher repair cost.

Good maintenance will prolong the life of motors. There is a point with each motor where attention is required. At this point motors should be taken out of service and overhauled. The expense, in most cases, will be far less than if the motor is allowed to operate until it fails completely. Careful inspection and good judgment are all that is needed to determine when a motor should be overhauled.

38. Incomplete inspection and unorganized maintenance result in burned-out motors.

The importance of a complete inspection record system and a well organized preventive maintenance program cannot be overemphasized. Set up a record system and organize maintenance to attain maximum efficiency. Increased production and performance along with a lower maintenance cost, will be the final outcome.

MINE	SEPT 3-15	17-29	OCT 1-13	15-27	OCT 29-NOV 10	12-24	NOV 26-DEC 8	10-22	24-31
SHAMROCK NO. 1	CANDIDATE A	F	E	D	C	B	A	F	E
NO. 3	CANDIDATE B	A	F	E	D	C	B	A	F
NO. 4	CANDIDATE C	B	A	F	E	D	C	B	A
NO. 5	CANDIDATE D	C	B	A	F	E	D	C	B
NO. 6	CANDIDATE E	D	C	B	A	F	E	D	C
UNITED SPLINT	CANDIDATE F	E	D	C	B	A	F	E	D

MINE ROTATION SCHEDULE over a 3-mo period enables six foremen trainees to (1) gain first-hand knowledge of mining conditions and systems in six mines and (2) observe 30 to 40 foremen on duty.

Training Topnotch Foremen

Truax-Traer's West Virginia Div. finds that extensive on-the-job training coupled with classroom instruction is pointing the way toward a supervisory force:

More stabilized in quantity and quality . . . More keenly aware of the value of human relations in job performance . . . Better informed on company standards and the foreman's duties

A TECHNIQUE for converting rank-and-file skilled workers into top-rated foremen has been developed by management of West Virginia Div., Truax-Traer Coal Co., Kayford, W. Va.

The technique is built around a foreman's training course which combines 8 hr of on-the-job visual education with 1 hr or more of classroom instruction. With the course running 3 mo, this means that each trainee devotes 600 hr to seeing how the foreman-on-duty does his job and a minimum of 75 hr to textbook learning, discussion and home study.

Initial results of the first course session—completed Dec. 31, 1956—indicate that combined on-the-job and classroom training is pointing the way to a supervisory force more stabilized in quantity and quality, more keenly aware of the value of human relations in job performance, and better informed on company standards and the foreman's duties. Within 2 mo after completion of the course,

four out of the ten students passed their foreman's exam and one of these has already achieved top-rating as a foreman on the job.

Confidence that the remaining graduates will pass their exams and move toward or achieve top foreman rating is based on the high pitch of enthusiasm, alertness, initiative, industry and inquisitiveness which gripped all students who participated in the first session. Such qualities are considered vital to converting the average skilled worker into a boss who is both effective and well-liked. This is the rare combination that puts a foreman on the top in mine production.

Joseph Q. Berta, chief, Safety and Industrial Engineering, has overall charge of the training program under the direction of H. M. Tibbs, general manager, and M. H. Shumate, assistant general manager. Currently, Truax-Traer's West Virginia Div. is producing about 11,000 tpd from nine drift, strip and auger mines.

The Kayford-management team recognizes the added cost of reassigning men to semi-productive jobs for full 8-hr shifts over a 3-mo period. But experience shows that above-average foremen are scarce and "imports" come and go. So, if extensive on-the-job training can inspire skilled workers from Kayford's ranks to become topnotch foremen, management considers that it will gain a full and quick return on its investment.

Added Needs Trigger New Program

The immediate reason for starting the Kayford training program was to give four acting foremen an opportunity to qualify officially for their rating. In the past, classes alone had been conducted for this purpose. But three added factors convinced management to expand from class study alone to a more comprehensive formal training

program combining classroom instruction and on-the-job visual education.

First, four new foremen were needed to supervise operations at Eunice Property Mines Nos. 7 and 8, opened in April, 1956.

Second, previous experience showed that "imports" were not a reliable means for acquiring topnotch, career foremen.

Third, it was realized that the intangible qualities of leadership which make the difference between an average and an outstanding foreman are better demonstrated by one-the-job observation than taught through textbooks.

Careful Screening From the Ranks

To get the course underway, management asked each mine superintendent to contact his men for volunteers and also to give his recommendations. The response of volunteers was gratifyingly high and permitted a careful screening of candidates. Screening was based largely on the candidate's alertness, job performance, and general knowledge of coal mining and the production cycle.

The six candidates finally selected held such jobs as repairman-helper, loading-machine operator, cutting-machine operator, tippie man and loading-machine helper. From this group, management planned to develop the four new foremen needed to fill supervisory posts at Eunice Mines Nos. 7 and 8.

Candidates Rotated to Six Mines

After selection, the six men were made section-foremen trainees for the 3-mo duration of the course. All men were then assigned to different mines for 2 wk of daytime on-the-job training. At the end of each 2-wk period, each trainee was shifted to another mine.

By rotating mine assignments (see chart) each man worked in six mines over a 3-mo period and was able to (1) gain first-hand knowledge of seam conditions and mining systems in six different mines and (2) observe 30 to 40 different foremen on duty. Four other men already holding positions as acting section foremen were not rotated but did take the classroom instruction.

Reactions Measure Impact

The impact of on-the-job visual education found expression in the many questions and comments which followed each trainee's mine assignment. As the course progressed, the trainee could see for himself the wide variations in foremen's performance. Comparisons were readily made, for example, on which foremen got the best response from their men and which took the most pains in good housekeeping. Perhaps most important of all, they noted:

1. That the mine or section foreman is the key to high productivity.
2. That the foreman's attitude—whether aggressive or lackadaisical—is reflected throughout the ranks of his men.
3. That many mining problems stem from lack of understanding between the foreman and his men.
4. That a good foreman must be able not only to handle men but also to get along with them.
5. That to be successful, a foreman must be a true leader—not only well-informed on the art of mining, but also well-versed in the limits of his authority, and well-practiced in how to be fair and when to be firm to all his men.

Two Classes Based on Mineforeman's Guide

After each 8-hr shift of daytime on-the-job training, each of the six trainees took 1 hr of classroom instruction starting at 4:30 PM. Actually, the students spent more than



SIMPLIFYING GUIDEBOOK DATA: R. E. Powell (standing) uses a booklet from West Virginia State College's Instructor Series to instruct C. Campbell (left), L. A. Eads, Nash Elswick and Jack Lowery.

1 hr on this phase of the program, as additional time was needed for home study and, in some cases, individual coaching. A second class was also held at 1:30 PM for the benefit of two of the uncertified acting foremen on the night shift.

Classroom instruction was based on the 1953 edition of the West Virginia Mineforeman's Guide and on ventilation maps issued by the state. To simplify certain guidebook subjects (mine gases, miner's flame safety lamp and ventilation), students also used booklets from The Instruction Series by U. G. Carter, director, Mining Extension Service, West Virginia State College, Institute, W. Va. The booklets are generally patterned from guidebook data.

Students Study 23 Subjects Under 4 Experts

Instructors for the first course session and the subjects they taught were:

R. E. Powell, assistant chief engineer, Engineering Dept.—Ventilation; gases; approval and permits; strip, auger, and punch; map ventilation; supervisor's duties; and human relations.

J. Cannon, chief, Industrial Engineering Dept.—Records; general mining practices; explosives; inspection report—explosives; belts and conveyors; and Airdox-Cardox.

R. Hively, superintendent, Maintenance Dept.—Electricity and inspection report—electricity.

E. L. Wiley, safety director—Instruments and apparatus; fires and explosions; first aid; roof-bolting; general safety; lamp assembly; gas test; and anemometer test.

(Ed. Note: Since the end of the first course session, Messrs. Cannon and Wiley have left the employ of of Truax-Traer Coal Co.)

Future Program

Kayford's new supervisory training program will be repeated whenever the need arises. Initial results of the first-course session have been most encouraging. Management officials are firmly convinced that the average skilled worker within a company's own ranks can be inspired to success as a foreman. As they see it, however, the proper technique must be used to reach down inside a man and pull out his untapped talents. That technique should be based heavily on visual on-the-job training. Textbook instruction informs but on-the-job training inspires.



1 Draining workings through 4-in pipeline

MINE DRAINAGE LINE, discharging about 370 gpm at present duty, extends down through 416-ft-deep borehole to natural sump in mine. Centrifugal pump driven by 100-hp DC motor in underground pumphouse moves the water.

Dual-Purpose Borehole Serves

Well-planned methods and a new shopmade unit for easier placement of borehole piping contribute to improved drainage and power transmission in underground workings at Crucible mine.

UTILITY, ECONOMY AND EFFICIENCY are three major advantages achieved through construction of a drainage-and-power borehole at Crucible mine, Crucible Steel Co. of America, Crucible, Pa., in which a 4-in pipe has been installed to remove water from the mine and four 2-in pipes to carry power conductors from a surface substation into the underground workings. These utility lines have been grouted into a 10-in borehole which is 416 ft deep from the surface to the top of the coal. The borehole enters the workings at a point near a good natural sump and near active producing sections, thus

eliminating the problems of long-distance pumping and power supply.

Equally as interesting as the dual-purpose application of the borehole are the ideas employed in placing the 4- and 2-in pipelines for water and conductors. The process was greatly expedited by the use of a shopmade jig, shaped somewhat like a torpedo, which was lowered into the hole to guide the pipes down to their final position. The jig and the lowering methods were worked out at the mine by C. B. Tillson Jr., general superintendent, J. E. Ellis, superintendent of maintenance, and A. V. Faull, mine superintendent.

The jig, as shown in accompanying illustrations, is 4 ft long and has an outside diameter of 9½ in. The nose is tapered to prevent the unit from hanging up in the hole, and the 4-ft length insures that when the jig lands at the bottom the water and power-conductor pipes will project the proper distance from the roof to permit the bottom connections to be made. The jig actually was landed on a pedestal made of half-headers and wedges, then, after the pipes were grouted in, the wedges were removed to permit the jig to drop away from the pipes and to be removed without disassembly.

PLACING BOREHOLE PIPES

The pipes were placed in the borehole as follows:

A ¾-in rope from the drill was passed through a hole in the top of the jig and socketed inside the jig. A hole in the side of the jig provided access to the rope for placing the



2 Providing DC power for mining equipment

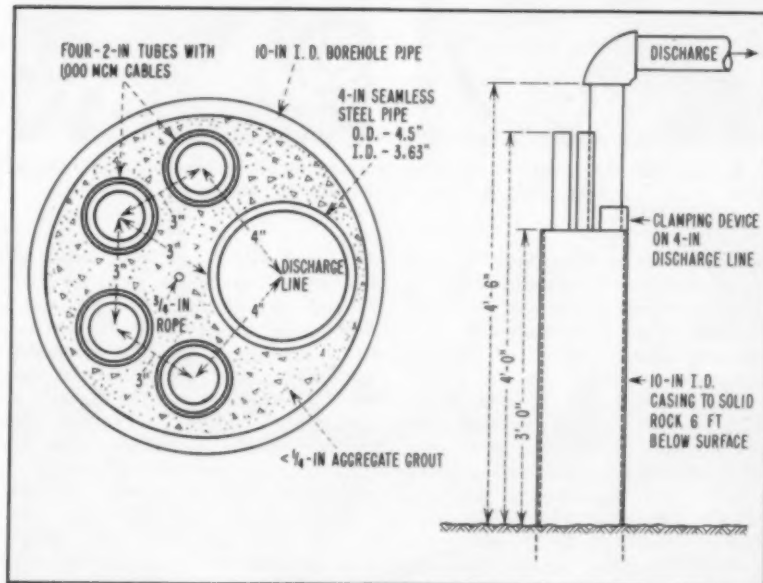
PAIR OF BOREHOLE CABLES (two more were installed later) transmit DC power from mercury-tube rectifier in surface substation to underground circuits. Insulating bushings at ends of 2-in borehole pipes protect cable jackets.

Producing Sections

socket and later for cutting the socket off after the jig had landed on the bottom.

Studs are welded on the top of the jig according to the pipe layout pattern, shown in an accompanying diagram. The studs provide a means of keeping the pipes in proper position as the string is lowered into the hole. Studs for the 2-in pipe are longer than the one for the 4-in pipe to permit the 4-in pipe to project a greater distance from the roof than the 2-in pipes when the string is in final position. The 2-in pipes are connected by threaded fittings but the 4-in pipe is welded at the joints, and tack-welded to its stud to eliminate any possibility of having the pipe hang up in the hole and pull away from the jig during the lowering operation.

At the top, placement of the pipe was started by attaching the first course of pipe. Installation of each course, including welding the 4-in pipe, required 25 min, except for the



BOREHOLE POSITIONS of pipes (left) and surface connections (right)



PIPE CONNECTORS are tack-welded to jig to prevent separation from jig if pipes hang in hole.



PIPE is lowered to this position to receive next set of 20-ft lengths.

Special jig solves problem of lowering pipes in proper position



C. B. TILLSON JR., general superintendent at Crucible points out studs which maintain pipes in position and tapered nose on jig.



Board of the Pennsylvania Dept. of Forests and Waters.

COSTS AND FACILITIES

Total cost of the pipe for the job was \$1,084. The borehole was drilled by a contractor at a cost of \$3.50 per ft, and the total cost of drilling, placing the pipe and welding the joints of the 4-in pipe was \$1,710. Total cost of grouting, labor and materials, was \$416 for placing 4½ cu yd of transit-mixed grout. Building the jig required four manshifts in the shop and two machinist shifts.

The substation at the surface is equipped with a 500-kw Westinghouse sealed-tube ignitron rectifier with the DC breaker set at 2,200 amp. The borehole cables are 1,000-MCM rubber-insulated conductors, rated at 75 C rise. Since the photos for this article were taken another pair of these cables have been installed in the other 2-in pipes to handle increased demands soon to be placed on the substation. At the time the mine was visited, average demand over a 4-hr peak period on producing shifts was 260 kw, including the mine load and the pumping load.

The pump is a two-stage Ingersoll-Rand centrifugal unit driven by a 100-hp General Electric DC motor. The pump is rated at 400 gpm at a 498-ft head at 1,770 rpm. Maximum discharge can be 550 gpm with forced ventilation on the motor. However, present requirements demand a discharge of about 370 gpm on a pumping cycle of 10 hr per day.

last four courses when brake trouble on the drill hoist increased installation time to 40 min per course. Also, the elasticity of the rope resulted in some bounce while lowering but this did not cause trouble.

When the jig and pipes landed in final position the rope was retracted and the holes around the pipes were filled with wedges and caulked with brattice cloth to confine a 15-ft plug of grout at the bottom of the hole. The remainder of the hole was grouted the following day by using a 1-in grouting pipe in the position formerly occupied by the rope.

As soon as the hole was completed two power conductors were lowered through two of the 2-in pipes, connecting the substation at the surface to the working section. A few months later the pumping system was installed, requiring the installation of 400 ft of 6-in pipe from the foot of the borehole to the pump and 80 ft of suction line between the pump and the sump. Surface piping (50 ft) which leads the discharged water into natural drainage channels also is 6-in diameter. The system is operated in accordance with a drainage permit issued by the Sanitary Water Control

PUMPING CONTROLS

The pump, motor and control cabinet are installed on a concrete slab in a cinder-block pumphouse. The motor starter provides for time sequence starting through accelerating relays. A 400-amp Ensign circuit breaker at the borehole protects the pump power circuit.

The control scheme is designed for automatic starting of the pump with a float switch at the sump actuating the starting sequence. However, safeguards have been added to the control system to prevent the pump from operating without water. Water from the dust-allaying spray line is piped to the pump to insure that the pump casing is full when the pump is idle. This supply of priming water is automatically shut off by a Mercoid solenoid valve as soon as the pump begins to move water. Without this shut-off arrangement the pump would return to the surface about 75 gpm of the spray water, thus wasting spray water and pump power.

On the other hand, if the pressure on the discharge side of the pump does not build up to 175 psi within 40 sec after the drive motor starts, the power to the drive motor is shut off through the action of an Agastat and a Square D pilot relay.

The underground 6-in pipelines are assembled with the use of Vic-taulic couplings which grip grooves at the ends of the 20-ft lengths of pipe. Joints at the foot of the borehole are welded. This was the reason for having the 4-in pipe project farther from the roof than the 2-in pipes in order to keep the welding heat from damaging the cables which had been installed earlier.

The cable jackets are protected from abrasion at the points where the cables leave the pipes by insulating bushings installed in the ends of the pipes. The bushings do not restrict the flow of air around the cables in the pipes, but in any event Mr. Ellis figures the current-carrying ratings of the cables should be reduced by about 10% because of the resulting decrease of ventilation caused by placing the cable in the relatively small area of a 2-in pipe. The cables are 1.58 in. O. D., and the pipe is 2 in. I. D.

Having developed this system for installing utility lines in boreholes, Crucible officials designed their sub-station facilities to permit rapid dis-assembly and relocation. Thus, as the center of production moves in the mine, the power and drainage facilities can be moved along to maintain high efficiency.



PUMP drive motor and control cabinet are safely installed in concrete-lined underground pumphouse. Spray-water system provides priming water.



FLOAT SWITCH in sump 80 ft from pump intake actuates starting sequence. Protective controls stop drive motor if discharge pressure fails to build up.



CHURN DRILL was used to sink 10-in borehole and 3/4-in line from drill hoist was used to lower pipe as new sections were added.



From the No. 9 Seam . . .



Via overland belt . . .



Into raw-coal stockpile . . .

DeKoven Mine: Efficient Producer

Pittsburg & Midway's first big deep mine, on the Ohio River at Sturgis, Ky., provides lessons in . . .

- Use of 7.2-kv, AC, power underground
- Value of raw- and washed-coal stockpiling
- Long-distance belt transportation
- Simplified preparation of a single product

MODERN is the word for DeKoven mine, the newest giant among coal-producing properties. Starting from scratch to construct a mine in western Kentucky for the specific purpose of loading a high-quality indus-

trial fuel on the Ohio River, the officials and engineers of Pittsburg & Midway Coal Mining Co. have arrived with a deep mine boasting 7.2-kv AC power in the primary distribution system underground, a 2½-

mi overland belt-conveyor system from mine to cleaning plant and from plant to river, a modern river-loading dock and efficient raw- and clean-coal storage facilities at the cleaning plant to minimize the effects of outages or delays anywhere in the system. The cleaning plant is a twin-circuit installation which further increases the inherent flexibility of the entire operation.

The DeKoven workings are in the No. 9 seam which averages 59-60 in thick. One of the first requirements of the project was to core-drill the area to correlate the No. 6 and No. 9 seams and to determine the lay of the coal as a guide in designing the openings. In the meantime, mining rights were acquired which are sufficient to insure a long, productive life for the DeKoven property. Total reserves now blocked out include 10,000 acres in the 59-in seam.

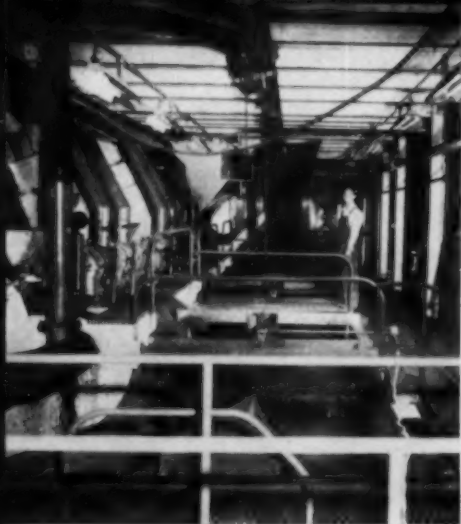
DeKOVEN HIGHLIGHTS

First coal was produced at DeKoven June 17, 1956, and first coal was loaded on the river in September. Coal is produced underground by four high-capacity conventional mining units operated by eight 12-man unit crews on a two-shift schedule. However, P&M engineers and mine officials are now in the process of introducing two Colmol units as the latest phase in the company's planning to increase production to 100,000 tons per month in 1958.

Only one of the units operates on DC power; all others are AC-powered from a primary distribution system at a potential of 7,200 v, AC.



E. R. PHELPS (right), P&M's vice president—operations, supervised development of DeKoven project. C. C. Qulrey (left), is general superintendent.



Through washboxes . . .



Into clean-coal stockpile . . .



Then away to the river . . .

of Industrial Fuel

This is reduced to 480 v at unit substations to insure a 440-v, AC, face voltage.

Face haulage is provided by shuttle cars, but from the underground discharge stations to the river-loading dock, more than 2½ mi away, belt conveyors are the transportation media. An initial scalping of large-size refuse is made in a rotary breaker at the mine portal. The raw coal then is transported 6,200 ft via overland belt conveyors to the raw-coal storage area at the cleaning plant. Clean coal is taken out of storage at the cleaning plant and transported 6,600 ft to the barges at the river-loading dock. The raw-and clean-coal stockpiles, to be described more fully later in this article, minimize the effects of possible delays or outages in mining, cleaning or river loading.

Current production is about 3,600 tpd and total employment averages 185 men per day, present for duty, including all supervisors and office personnel. All the coal mined and cleaned at DeKoven is shipped as a single product, 3x0, to the Joppa steam-electric station of Electric Energy, Inc., Joppa, Ill. However, as production expands other customers will be using DeKoven coal. Facilities have been provided for loading on the Illinois Central railroad, but so far virtually all output has been shipped on the river.

PLANNING THE MINE

Three major problems complicated the planning at DeKoven. In the first place, previous mining had been done by other companies in the area



PREPARATION PLANT employs gravity flow and belt conveyors wherever possible to further simplify materials-handling in this single-product process.

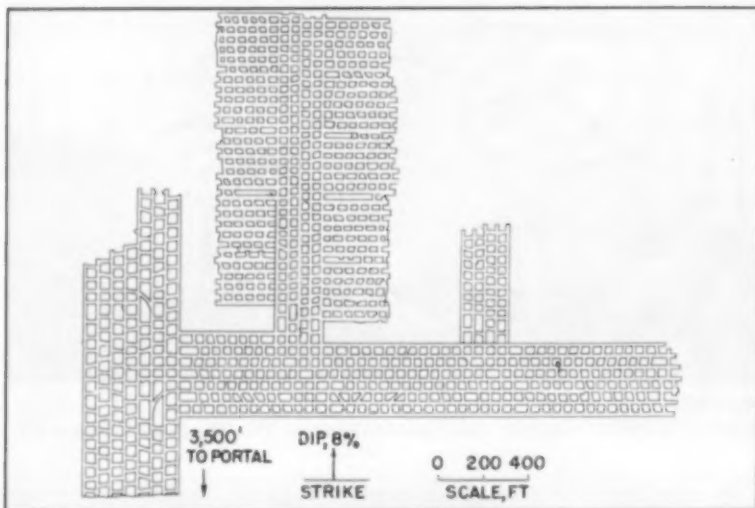


LOADING AND BARGE HANDLING under loading boom are controlled by operator from control house on superstructure.



MINING CYCLE in 59-in seam begins with roof bolting on 4-ft centers using 30-in bolts (left), followed by undercutting to a depth of 7½ ft. Numerous sulphur inclusions project from roof but coal breaks away cleanly.

Four high-capacity conventional units and two new



RECOVERY PLAN now in use specifies driving 1,500x850-ft room panels down dip from strike entries on advance and up pitch on retreat.

between the river and the tracts acquired by P&M, making it necessary to provide barrier-pillar protection between these old workings and the new projections. Second, the flood history of the Ohio River had to be closely studied to design against possible future inundation of the mine or plant or transportation system. Third, the seam dips 8%, which creates problems in mining, drainage and ventilation.

These three problems directly influenced the selection of the portal site. The opening was made above the historical flood crest of the river,

and it was so situated that when the slopes entered the seam there would be a 750-ft barrier between the slope bottoms and the old workings.

The dip of the seam is N 15 deg East. The bearing of the slope is N 17 deg East. Thus all cross-entries turned from the mains to the right at 90-deg angles have a gradient in favor of drainage. Production is to be concentrated in room panels to the right of the mains (facing inby) as the mine advances to the property limits and room panels to the left of the mine will be worked on

retreat. Based upon present production plans, DeKoven has a projected life of more than 30 yr.

As shown in the map of the workings, the cross entries are turned from the mains on 3,050-ft centers. Panel entries on 825-ft centers are driven 1,500 ft long to the dip first, then up the pitch from the other side of the cross entries on retreat to open the room panels. Working first to the dip provides sumps that can be used to collect drainage from the subsequent pitch workings and further provides that the dip workings will be completed before extensive open areas are created. It is also thought by DeKoven's planners that methane drainage will be improved by opening the dip workings first.

Three drainage rooms were driven near the foot of the slopes early in the development period to serve as a sump for slope drainage. The air, supply and belt slopes are connected to the sump rooms by a drainage ditch. The supply and belt slopes are 903 ft and 887 ft long, respectively, to the coal on a gradient of 17 deg 54 min. The air slope is 760 ft long, on a gradient of 23 deg 19 min for the first 200 ft, then 19 deg 23 min to the coal.

The first 1,200 ft of main entry was driven from the foot of the slopes by a single mining unit. Thereafter, an eighth heading was added to permit better utilization of two units operating abreast until the projection for the first cross-entry was reached. The first cross-entry is to



FOUR SHOTHOLES are drilled across face of 22-ft working place to within 6 in of back of cut. High-capacity loading machine discharges into shuttle cars which feed belt conveyors in panel, cross- and main-entries.

continuous units steadily raise DeKoven's output

be driven 14,000 ft long; other inby cross-entries will be progressively shorter to conform to the shape of the property.

Dimensions of the underground openings are as follows:

Mains—Eight heading 15 ft wide on 60-ft centers;

Cross entries—Seven headings 15 ft wide on 50-ft centers;

Panel entries—Five headings 15 ft wide on 50-ft centers;

Rooms—300 ft long and 22 ft wide on 45-ft centers.

FACE OPERATIONS

The list of equipment for each mining unit includes a Goodman 966C loading machine, a Goodman 2410 universal cuttings machine, two Goodman 580 shuttle cars, a Jeffrey 56 FHR coal drill and a Joy RBD-15 roof drill. All shuttle cars are DC powered, but the other machines in three of the units are AC powered. The fourth unit is totally DC powered.

The 12-man face crews include a foreman, a loader operator and a helper, a cutting-machine operator and a helper, two shuttle-car operators, a roof bolter, a coal-drill operator, a shotfirer, a mechanic and a ramp man.

Rooms are driven in pairs, and initial projections provided for leaving a solid pillar between sets of six rooms to serve as a fire wall. However, subsequent experience has shown that safety and productivity are better served by driving conven-

tional crosscuts through this pillar. The crosscuts provide additional working places for a smoother cycle throughout the recovery of a room panel, better ventilation is assured and, as an added attraction, percentage recovery is increased.

Starting with a cleaned-up place, the cycle is roof bolting, cutting, drilling, shooting and loading. Bolts are installed on 4-ft centers, both ways. These are 30-in expansion-shell units. The cutting machine, laced with double-pointed throwaway bits, works under bolted roof

to make a 7½-ft-deep kerf at the bottom. The drill follows, making four 2¼-in holes across the face of a 22-ft room. The two rib holes are 6 in from the outer limits of the cut and the center holes are spaced at 7-ft intervals. All are drilled to within 6 in of the back of the cut.

The shotfirer charges each hole with three sticks of 1¼x6-in permissible explosives to break the cut. The high-capacity loading machine, rated at 8 tpm, then completes the cycle by loading out the cut in shuttle-car loads that average 3.8 tons. The shuttle cars discharge directly onto the 36-in panel belt. The cross-entry and main-entry conveyors, which follow in the transportation system, are 42 in units.

The slope and main-entry conveyors, transporting coal up the pitch of the seam and up the slope, are to be installed in units 1,750 ft long, each unit being driven by a 150-hp wound-rotor General Electric motor. A 75-ton surge hopper at the foot of the slope equalizes the burden on the slope belt. Cross-entry conveyors will consist of units 4,000 ft long with similar drives. Panel belts are 1,500 ft long driven by 75-hp motors.

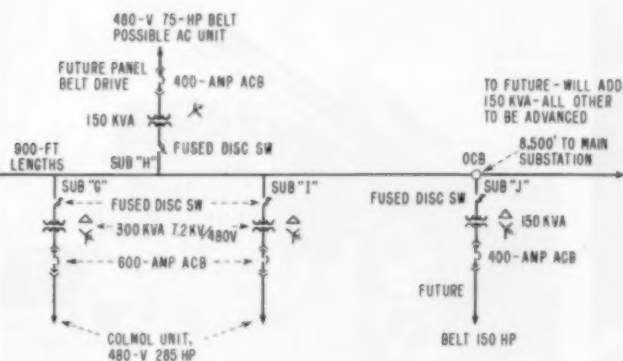
The choice of conventional face equipment by P&M officials was influenced by the fact that numerous sulphur balls project from the roof into the seam. It was thought this condition might place limitations on continuous mining. However, experience in the mine shows that a clear height of 52-53 in below the sulphur

Pittsburg & Midway Officials...

H. H. Spencer, Chairman of the Board
K. A. Spencer, President
E. R. Phelps, Vice President—Operations
G. D. Grayer, Assistant to Vice President—Operations
Frank Barrow, Vice President—Sales
D. F. McKenzie, Vice President—Sales
Frank Irwin, Chief Engineer
Henry J. Hofmeister, Treasurer
W. C. Spencer, Assistant Chief Engineer
Elmer Citron, Preparation Engineer
F. J. Foresman, Director of Industrial Relations

DeKoven Officials...

C. C. Quirey, General Superintendent
Carlton Lovan, Mine Manager
Carl C. Whitehead, Electrical Engineer
C. C. Quirey, Jr., Preparation Foreman
R. D. Whitner, Mining Engineer
Hugh Stewart, Chief Clerk



power demands proper face voltage.



RECORDING WATTMETER notes cutter consumption and demand.

simplicity when proper face voltage is maintained

framework. The primary distribution cable is 12-kv Simplex shielded (Type SH-D) with 4/0 conductors. In the cross entry this primary cable is installed in 900-ft lengths which provides convenient tapping points at panel-entry center distances.

Protection from electrical shock is provided for workmen by resistance-grounding of the neutral point in the transformer secondaries at all substations, as shown in the power-distribution diagram. At unit substations the grounding resistor is made up of three 30-ohm Ward-Leonard resistors connected in parallel. Total resistance of the assembly is 11.1 ohms, thus limiting current flow in possible ground faults to less than 40 amp before the breakers act to isolate the grounded equipment.

Unit substations are connected to Ensign safety-circuit centers in the sections by 1,000-ft of 600-v Type G-3 4/0 conductor cable. Trailing cables to face units are 500-ft long. The rule at DeKoven is to move up the substation when this 1,500 ft of cable has been used to its limit. Adding more trailing cable is not permitted because of the lower face voltage that results from using long cables. Voltage at the underground substations is 480 v to insure 440 v at the face.

DC power for the shuttle cars, three DC belt drives, two 6-ton supply locomotives and one of the four mining units is produced through

parallel operation of a 150-kw m-g set and a 300-kw mercury-arc rectifier.

All unit substations are skid-mounted General Electric OA-T1 Pyranol-filled transformers. They can be towed to new positions by the shuttle cars. A minimum of preparation is required in setting up at new locations because there is no need to build cells to house the equipment.

Power is distributed on the surface through pole lines paralleling the overland belts all the way to the river. The rough-cleaning plant near the portal, the main cleaning plant, the loading dock and the intermediate belt drives are equipped with their own substations.

STOCKPILING FOR FLEXIBILITY

The raw-coal stockpile has a rated storage capacity of 15,000 tons and the clean-coal stockpile, 36,000 tons. However, both can be increased by assigning bulldozers to spread out the material discharged into either stockpile.

Mr. Phelps points out that the desire to achieve maximum flexibility throughout the entire operation was the main reason for P&M's investment in storage and reclaiming facilities. The river-loading operation can continue even though the cleaning plant is not working. Similarly, the cleaning plant can work from the raw-coal supply when operations at the mine are interrupted for any

reason. The mine and plant can work when the river-loading units are idle. Thus, the three main elements of DeKoven's operations, mining, cleaning and loading, are fully independent of each other. It follows that any of these elements can be taken off the line for maintenance without affecting the other two. For example, the cleaning plant was taken off one day during the writer's visit to permit the washboxes to be properly cleaned out and the interior of the plant washed down. The clean-coal stockpile had been previously built up to full capacity to serve the loading dock while the plant was cleaned.

One other big advantage of clean coal stockpiling is the natural dewatering which takes place. The capacity of the stockpile is such that normal input to and reclaiming from the pile result in a retention time of about 72 hr in storage. Surface moisture is reduced to a minimum, except during heavy, prolonged rains, but at such times heat- or mechanically-dried coal would be exposed to the weather in the open-top barges.

In designing for stockpiling, P&M engineers decided against the use of earthen dams to contain the stored coal, preferring that the coal at the perimeter of the pile serve as a dam. Then, at times of heavy demand, the dam itself could be bulldozed into the reclaiming hoppers. Accordingly, hillside sites for both stock-



STARTING 2½-MI TRIP to Ohio-River barges, raw coal passes through rotary breaker onto 36-in overland belt.

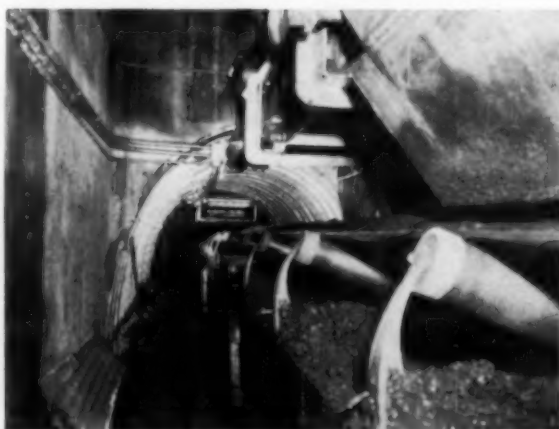


RAW COAL is stockpiled in 12,000-ton pile and reclaimed on plant demand. Two feeders supply reclaiming belt.

Raw- and clean-coal stockpiles add flexibility



CLEAN-COAL STACKER begins new buildup of 36,000-ton stockpile for barges. Stacker is automatically controlled.



RECLAIMING BELT OPERATES IN STEEL-LINED TUNNEL under clean-coal stockpile to return coal to river.



BULLDOZER feeds naturally drained clean coal into reclaiming hoppers.



RIVER BELT is carried across flood plain on bents 2 ft above record crest.

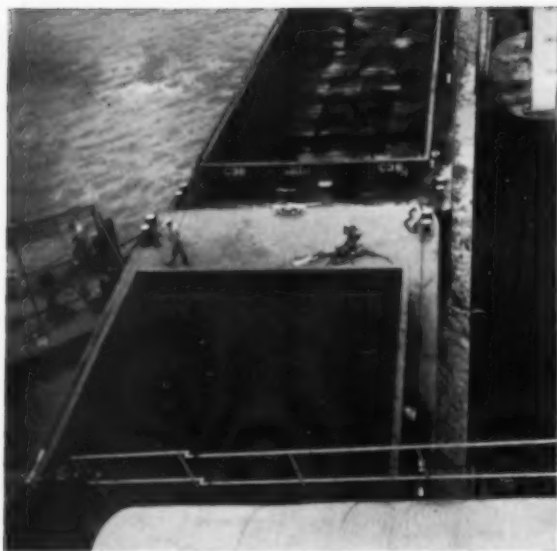


AT RIVER, hinged belt permits low-level loading at any water height.



-
- A black and white photograph of a large industrial machine, likely a steam engine or pump. The machine is complex, featuring a large flywheel on the right side, various pipes, valves, and structural components. The image is somewhat dark and grainy, typical of older industrial photography.

(Continued on next page)



RIVER BOAT, operated by 2-man crew, places barges under loading boom and makes up tows.



DEKOVEN PIER extends 1,175 ft along river bank, providing mooring for seven empty and seven loaded barges.



PLANT POWER CENTER is checked by C. C. Quirey Jr., foreman.



DAILY QUALITY checks are made by Charles Sommers, coal analyst.

piles were selected, to keep the length of the stackers to a minimum, and cuts were made in the slopes to provide floors for the stockpiles. Movement of coal in and out of storage is as follows:

Run-of-mine coal is discharged from the slope conveyor into a rotary breaker which passes 3x0 raw coal onto the overload belt and removes plus 3-in sulphur inclusions and other oversize refuse, which amounts to less than 1% of the r-o-m. Raw coal from the breaker is loaded onto the first of three conveyor flights to be transported 6,200 ft to the raw-coal stockpile at the

cleaning plant. Lengths of the three 36-in conveyors are 1,650 ft, 1,450 ft and 3,100 ft long, respectively, from the rotary breaker to the raw-coal stacker. Conveyors for all surface belts were furnished by Continental Gin Co. The belting is Good-year 5-ply rayon with $\frac{3}{4}$ in $\frac{1}{16}$ covers.

The last of the three conveyors discharges into the loading hopper of a radial stacker which swings through an arc of 15 deg to build up the raw-coal stockpile over two reclaiming hoppers. The swing of the 120-ft-long stacker is controlled by limit switches and reversing relays.

Reclaiming tunnels under the stock-

piles are constructed of concrete slabs and sills to support Armco corrugated-steel tunnel liners. Two opposed reciprocating feeders are installed at 60-ft intervals under the reclaiming hoppers at the base of the stockpiles. The two feeder units under the raw-coal pile discharge the reclaimed coal onto a 250-ft 48-in collecting belt which in turn discharges to the 180-ft-long 42-in elevating belt conveyor entering the cleaning plant.

Products of the washboxes and the fine coal cleaners are blended at the other side of the plant on the washed-coal 42-in belt conveyor which extends a distance of 650 ft out to and along the uphill side of the clean-coal stockpile. The 75-ft-long clean-coal stacker receives coal from a track-mounted tripper. The tripper and stacker are integrally mounted.

The traversing action of the stacker assembly also is automatically controlled through a system of paddle switches, limit switches and timing relays. The unit remains in one position discharging coal into the stockpile until the rising pile deflects a paddle switch at the head of the stacker. The entire assembly traverses a distance of 3 ft, which it does in 3 sec, then stops. The stacker discharges without interruption during these moves. When the limit of the stockpile is reached, the stacker unit reverses automatically to deadhead back to the beginning of the pile.

Six reclaiming hoppers, each with reciprocating feeder units have been

installed under the clean-coal stockpile. Any combination of these may be employed to load the clean-coal collecting belt in the tunnel under the stockpile.

The 48-in collecting belt discharges at right angles onto a 42-in 220-ft-long loading belt which terminates at the two-track railroad loading station. In normal operation the railroad is bypassed by chuting the coal onto the first of three flights leading to the river loading dock. Total length of these three conveyors is 6,600 ft in 1,700-ft, 2,400-ft and 2,500-ft flights from railroad tippie to river.

Merrick Weightometers on the short loading belt are equipped with Eagle Electric Co. Microflex counters which control the operation of the clean-coal feeders. These integrating counters, receiving their data from the Weightometers, stop the feeders as soon as they have delivered a predetermined tonnage of coal. They are set to deliver one bargeload, 1,500 or 1,550 tons, then stop the feeders. When the loading operator's remote counter registers the desired tonnage and he sees a section of belt approaching with no load, he knows the barge under the boom will be fully loaded when the coal ahead of the void has been discharged. The coal following the void on the belt is for the next barge.

The clean-coal conveyors from plant to river cross the flood plain, making it necessary to install them on an elevated structure. Tops of the structural steel bents in the structure are at an elevation of 370 ft, above sea level. The highest recorded crest of the river is at an elevation of 368 ft. The bottom run of the belt conveyors is about 6 ft above the tops of the bents.

Each of these bents is supported by two 14-in round concrete-filled Armco piling. The piling were driven to the required bearing (about 30 ft) and capped with ¾-in base plates approximately 2 ft above ground.

Loading at the river requires the services of 6 men, as follows:

A belt patrolman on conveyors from the stockpile to the river,

One bulldozer operator at the stockpile,

An attendant in the clean-coal reclaiming tunnel,

A loading-boom operator at the river,

An operator and helper on the barge-handling boat.

The river installation consists of 11 steel pile cells rising 50 ft above normal pool level and driven to rock in the bed of the river. Two cells 20 ft in diameter and one 16 ft cell support the 100-ft-long loading boom which is a continuation of the final conveyor. The boom is hinged to compensate for fluctuations in the level of the water. The eight other cells are strung out along 1,175 ft near the shore line to provide moorings for empty and loaded barges and to provide for installation of control lines that move the barges under the loading boom. Loading rate is 1,000 tph, the rated capacity of the 42-in conveyor from the clean-coal stockpile.

The interlocking piles were driven to form the cells which were then filled with graded sand. A 14-in reinforced concrete cap was poured at the top of each cell to complete the job. The cells were built by Dravo Corp.

CLEANING DeKOVEN'S 3x0 PRODUCT

The flow sheet and equipment for the DeKoven cleaning plant was designed by P&M engineers in conjunction with Roberts & Schaefer Co. It features twin-circuit washing which adds a final degree of flexibility to the entire operation. In the event one circuit is interrupted the other continues to feed the clean-coal stockpile. Major washing units are a pair of 84-in, 8-cell Jeffrey jigs and a pair of fine-coal jigs designed by Elmer Citron, Pittsburgh & Midway preparation engineer.

The plant is designed to produce a single-product 3x0 industrial fuel, the purpose P&M's officials had in mind at the inception of the DeKoven project. Simplified gravity flow of materials-in-process and belt-conveyor transportation of refuse and product contribute to smoother operation of the plant, and the concentration on producing one product eliminates any need for blending and recirculating conveyors.

The plant product averages 12,500 Btu per lb and 8% ash. Uniformity of quality, with respect to misplaced material in product and refuse, is satisfactorily maintained by washing at 1.45 sp gr. Total reject at the plant is about 14% of the feed.

The feed to the plant is distributed over four vibrating units which are now fitted with blank decks to serve as chutes rather than screens. Replacing the blanks with screen surfaces permits bypassing the ¼x0 around the washers, if that becomes

desirable. The raw coal is split equally between the two washboxes which produce clean coal, primary refuse and a middlings product for retreatment.

Middlings are crushed to a nominal 1½ in and screened at ¾ in. The plus ¾-in is returned to the main Jeffrey 8-cell jigs for rewashing. The ¾x0 is pumped to a hydraulic classifying cone from where it is fed to the two single-cell, fine-coal jigs. The coal product is dewatered and chuted directly to the product collecting belt running the full length of the plant on the ground floor. Refuse from the fine-coal jigs is dewatered and discharged to the refuse bin for truck disposal.

Also operating in the fine-coal circuit are four 5-unit batteries of 14-in Heyl & Patterson cyclones which thicken the overflow from the fine-coal hydraulic classifying cone, the ¼x0 hydraulic classifying cones and the ¼x0 middlings sump. The ¼x0 coal from the two drag tanks is pumped to two hydraulic classifying cones and the ¼x60M underflow from the cones is fed to four Hewitt-Robins 6x16-ft Elliptex dewatering screens. The underflow from the cyclones is deslimed on two Allis-Chalmers 6x16-ft vibrators before entering the refuse bin.

A pair of McNally-Pittsburg Gearmatic crushers may be used to crush the 3x1½ from the top decks of the clean-coal vibrators to minus 1¼ in if desired.

Fresh-water consumption is from 1,540 to 1,700 gpm. Reject water is sluiced by gravity to a nearby settling area formed by erecting earthen dikes. In time it is expected that clarified water from this pond will provide much of the makeup water.

Five men are employed in the plant, including equipment operators, a mechanic and a lubrication man. C. C. Quirey, Jr. is preparation foreman. In preparation, as in other operations at DeKoven, the recurring theme is high efficiency with minimum labor through complete mechanization.

SAFETY AT DeKOVEN

Safety performance at DeKoven also has been noteworthy. Since the beginning of production in June, 1956, there have been four lost-time accidents totalling 37 man-days of lost time. The safety program is in charge of F. J. Foresman, director of industrial relations for Pittsburgh & Midway, who conducts bi-monthly safety meetings for every employee on company time.



MODEL 1650-B, or the River Queen, will uncover two seams of West Kentucky coal. Overburden averages 45 ft. Parting averages 8 ft. The shovel, largest ever built by Bucyrus-Erie, requires only a three-man crew.

The River Queen . . . Key to High Tonnage

River Queen Coal Co.'s 55-yd shovel will set the pace during the company's bid to strip more than 2 million tons of coal annually.

80-TON OVERBURDEN BITES. Simultaneous two-seam stripping. 100-ton hopper cars, 30 to a string. A 1,000-tph preparation plant. Dock facilities to load barges at 1,000 tph.

These are the ambitious stripping means of the River Queen Coal Co. near Greenville, in Muhlenberg County, Ky.

This is the ambitious end—2 to 3 million tons of coal a year.

Operated by the Peabody Coal Co., the River Queen Coal Co., is owned jointly by Peabody and the W. G. Duncan Coal Co. Leaders of both are convinced of one thing—the key to high tonnage at the River Queen mine is the new 55-yd 1650-B River Queen shovel.

The largest shovel ever constructed by Bucyrus-Erie, the River Queen can swing its 55-yd bucket in a 45-sec cycle. At the mine, when three-shift operation begins in August, the shovel will be uncovering overburden averaging 45 ft to expose the 4½-ft west Kentucky No. 12 seam. With the No. 12 removed the River Queen will remove an 8-ft limestone parting to expose a 6-ft formation of the west Kentucky No. 11 seam. The two will be worked simultaneously.

Originally, the 140-ft high River Queen was conceived as a larger-bucket unit—60 to 70 yds, in fact. But this early specification was cut to 55 yd in favor of a longer boom. The one installed is 145 ft.

Other working specifications attest to the enormous size of the shovel. Its 86-ft dipper stick, for example, enables the River Queen to dump overburden as far away as 300 ft from its digging point. Maximum dumping reach from the outside edge of the crawlers is 122 ft 9 in. Dumping height is 106 ft. Dumping radius is 145½ ft. And cutting radius is 158 ft.

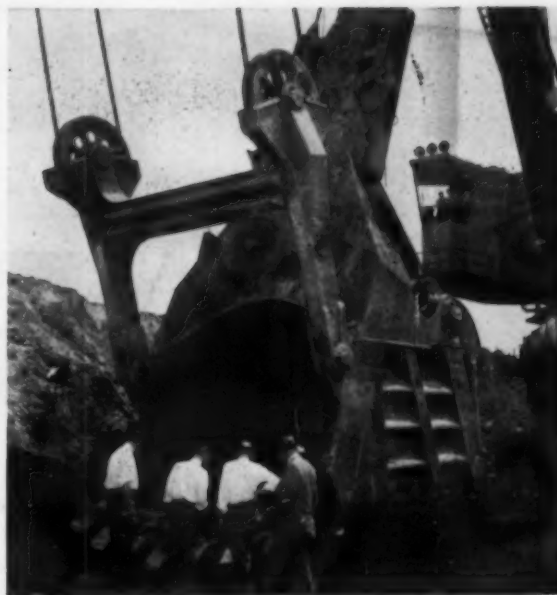
The River Queen's weight, too, is proportionately high. Its net is 1,975 tons; working weight, with 450 tons of ballast, is 2,424 tons, or the equivalent of a Navy destroyer.

More than 70 railroad cars were required to ship the shovel from the Bucyrus-Erie plant in South Milwaukee. The first units arrived last summer, and by March the River Queen had begun working the mine's crop pit.

Special high-strength alloy steels were used in the shovel's fabrication. The dipper, made of T-1 steel, and the dipper handle, made of Tri-Ten



RIVER QUEEN BOOM is 145 ft long. Height from boom sheaves is 140 ft. Wire ropes are 2½ in thick.



SPECIAL STEELS were used in bucket teeth. Control cab (background) is air-cooled, has only four control levers.

steel, are fabricated of metals sold by United States Steel Corp.

To demonstrate the shovel's capability the company points out that the River Queen, at the rate of one digging-dumping cycle in less than 1 min, will remove 100,000 tons of overburden in 24 hr.

LUBRICATION

Nearly all the lubrication requirements of the River Queen are met by automatic systems. The dipper, for example, is lubricated automatically with a Farval centralized oiling system. Hoist, rehaul and crowd are also automatically lubricated, but with Farval's spray system. Greases and oils are those produced by Ohio Oil Co. (Marathon) and by Whitmore.

POWER

The tremendous amount of power is generated by fifteen General Electric motors. Eleven motors are used for digging, four are used to propel the River Queen.

But, despite the obvious complexity of power a lone operator controls the entire digging operation with two hand levers and two foot pedals. In a glass-enclosed, air-conditioned cab 30 ft above the ground the operator has maximum visibility and the simplest of controls.

The shovel's main motors, two 1,500-hp AC synchronous units in the motor-generator sets, are the largest ever constructed by General Electric's DC Motor & Generator Dept. The sets have a maximum capacity of

7,500 hp and weigh 163,000 lb. Mounted on two 31-ft steel bases, the sets were installed in the 60-ft cab of the River Queen at the mine site.

Power to operate the shovel, is supplied from a skid-mounted substation, which receives 34,500 v from Kentucky Utilities Co., and cuts it to 4,160 v. The 3,750 kva unit can be moved overland on 30-deg slopes. A grounded neutral in the 4,160-v system provides personnel and equipment protection.

The two motor-generator sets provide DC power under variable voltage control for the main motion motors. One set is equipped with one swing, one crowd and two hoist generators. The second contains two hoist, one crowd and two swing generators.

The generators supply DC for four hoist (375-hp each), three swing (187.5 hp each) and two crowd (187.5 hp each) motors. The hoist motors deliver a combined maximum hoisting effort of at least 3,000 hp.

Three 250 - kva transformers mounted on the shovel provide for four 200-hp wound-rotor induction motors mounted above the crawlers.

CRAWLERS

Each of the crawlers is independently driven and each weighs 217.7 tons. The dimensions of each are: 13 ft 5 in wide, 26 ft 9 in long, 10 ft 9 in high. The ground man, one of the crew of three men, directs the machine's crawler movement (0.2 mph) from an electrical control box mounted at the base.

OVERBURDEN PREPARATION

Although actual high rate production has yet to begin and working plans must therefore be somewhat tentative the major approach to stripping at River Queen is definite.

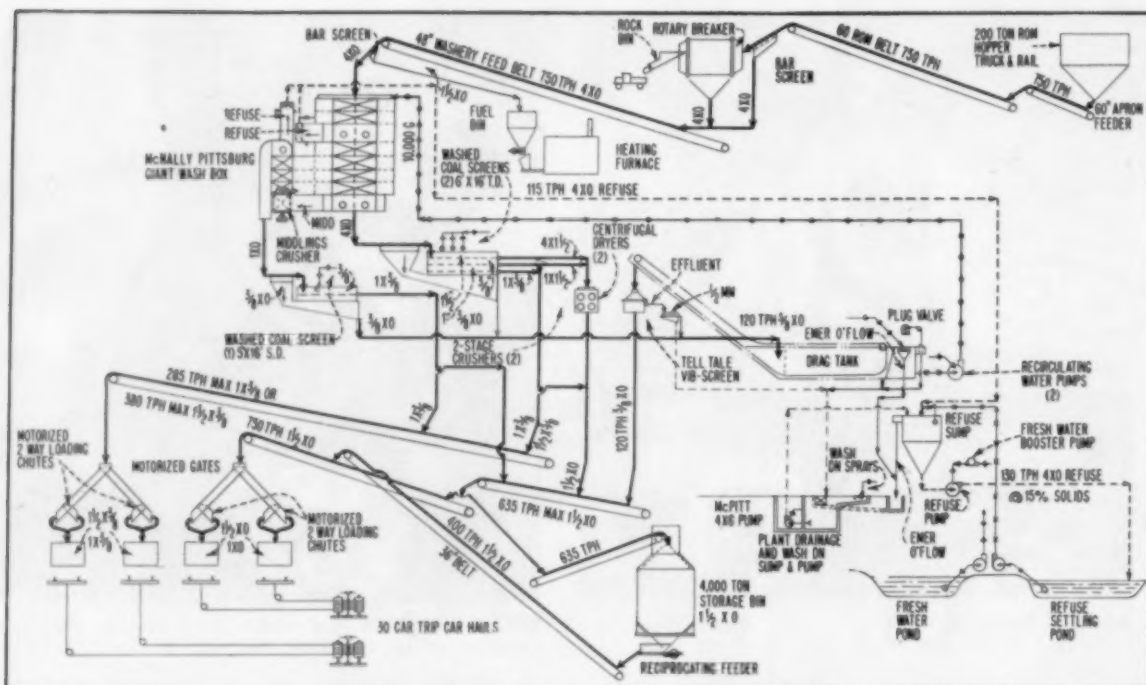
The preparatory drilling will be accomplished with a Bucyrus Erie 50-R drill, which will produce 10½-in diameter holes in a 30-ft spacing pattern. The pattern, however, is one of the "tentative things," notes Frank Gilbert, River Queen superintendent, "since the spacing will depend on the overburden encountered."

The blasting agent being used at River Queen is Olinite No. 7, an ammonium nitrate-based explosive manufactured by the Olin Mathieson Chemical Corp. Inserted in 9-in diameter cartridges, the Olinite will be detonated with Primacord.

Estimates now are that 3 to 4 cu yd of overburden will be removed per pound of blasting agent. But this is another variable and the estimate is a low one since only the "crop pit" is now being worked. During full production Superintendent Gilbert expects the yardage figure to climb to 5 cu yd per pound of blasting agent.

OVERBURDEN REMOVAL

With the drilling behind them, the three-man crew of the River Queen—an operator, groundman and oiler—will move the shovel in to clear away an average overburden of 45 ft at a rate of 3,000 yd per hr. The exposed top seam, or the 4½-ft No. 12, will be recovered with a 4161 9-cu yd



FLOW SHEET of River Queen preparation plant.



1,000-TPH PREPARATION PLANT is less than 10% complete. When operating it will produce 1x $\frac{1}{2}$ and 1 or 1 $\frac{1}{2}$ x0, employing first McNally Pittsburg Giant washer. From here coal will move 6 $\frac{1}{2}$ mi to Green River in 100-ton hoppers.

Marion loading shovel that will be positioned permanently on the No. 12.

With the No. 12 removed a 16-ton tear-drop billet, the business end of a super pinning machine, will be used to shatter the 8-ft limestone parting. Dropped from a height of 50 ft, the billet is expected to strike with a 1,600-ton impact. With the parting shattered the River Queen will return to remove it. Loading the exposed 6-ft No. 11 seam will be accomplished by another 4161 Marion that will be situated permanently on top of the seam, also.

Pit haulage at first will consist of five 61 cu yd Euclid trailers. But as production mounts more will be added. Haulage, again at first, will cover a distance of approximately $\frac{1}{4}$ mi, with a maximum later of 5 mi expected. Working in the pit will be a Caterpillar No. 12 road grader, one D-9 bulldozer, two D-8's, and a rubber-tired D-6. A haulage road, graveled now, will be oiled and black-topped as production progresses.

PREPARATION PLANT

The River Queen preparation plant,

built by McNally-Pittsburg, is less than 10% complete because of delayed steel deliveries. Specifications call for delivering 750 tph of 1x $\frac{1}{2}$ and 1 or 1 $\frac{1}{2}$ x0. But the River Queen Coal Co. expects to run coal at 1,000 tph.

Peabody's chief preparation engineer, Albert Massman, summarizes the plant as a physically compact, high efficiency operation. Its equipment includes a 200-ton ROM hopper, a 10x20-ft rotary breaker to produce 4x0, three vibrating units, a settling tank, and a 4,000 ton storage and blending silo.

The cleaning unit is the first of the new McNally-Pittsburg Giant washers. The specified capacity of the washer is the same as the raw-coal rotary breaker, or 750 tph.

In operation the plant will receive ROM in the 61-yd trailers mentioned above which will dump into the 200-ton hopper. From the hopper the coal will be conveyed to the rotary breaker, producing 4x0. The 4x0 will be delivered to the Giant washer, where it will be separated into three products—coal, middlings, and refuse.

The coal will be conveyed to three Allis-Chalmers vibrating, dewatering and classifying screens, and later crushed to 1½ or 1x0. The middlings will be passed to a 170-tph middlings washer. And washer reject, plant effluent, and dirty water will be pumped to the plant's refuse pond, which is under construction.

Coal ¾x0 will be delivered to the settling tank, from which overflow will be returned to the Giant washer by pumps. Concentrated coal from the settling tank will be delivered to a pair of Model EB-36 C-M-I continuous centrifugal dryers, receiving ¾x48 mesh at 30% moisture, and reducing the moisture to 6%.

Natural 1½ or 1x¾ from the primary washer will be conveyed to loading tracks No. 1 or No. 2 for chute loading. The 1½ or 1x0 crushed coal and the ¾x0 centrifuged coal, plus the natural 1½x0 can be delivered to a 65-ft 4,000-ton storage silo, or to loading tracks 3 and 4. The purpose of the silo, or bin, is to blend the No. 11 and the No. 12 seam coals, which analyze 12,500 and 11,500 Btu respectively.

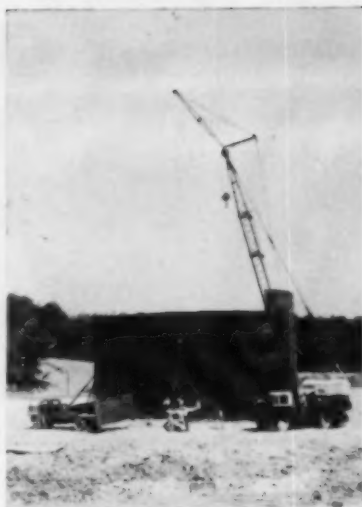
GIANT WASHER

The Giant washer is the newest addition to the McNally Pittsburg line. The unit retains the basic technical features of the McNally-Norton and McNally-Mogul washers, but rearrangement and certain revisions have added new characteristics.

A rearrangement of the washing cells is designed to greatly increase the capacity without increasing the difficulty of controlling transverse impulse distribution, which has been a major problem in Baum jigs as the width of the washing compartment was increased.

In addition, the Giant washer construction utilizes the features of the patented "compound" circuit. Crushed middlings are treated in a separate compartment with independent control of separation and products disposal.

Further, the construction provides for hydraulically delivering hutch ma-



4,000-TON SILO will store, blend two-seam coal. Unit will be 65 ft high.

terial from each compartment into an elevator serving that compartment. But where other hutch material disposition is wanted, hutch spirals, similar to those supplied with the McNally-Norton washer, can be inserted.

Although the Giant washer is definitely new, it contains no basic features which have not been used by McNally-Pittsburg before.

The washer contains a total washing area of 225 sq ft. The main washing compartments are 10 ft wide. The primary compartment consists of two cells or stages totalling 60 sq ft. The second compartment is a 4-cell unit with 120 sq ft. The middlings rewashing compartment is 5 ft wide and is constructed of 3 cells containing 45 sq ft.

McNally Pittsburg says the middlings rewashing arrangement is a definite advantage compared to rewashing crushed middlings in the same washer that produces them. First, says the company, the main washer is relieved of an additional tonnage load. Second, the arrangement precludes the possibility of accumulative recirculation of particles, which are still of intermediate specific gravity even after crushing.

More important, the company says, since the washability characteristics of crushed middlings are rarely the same as the original raw coal, the middlings are treated at the specific gravity best suited to their characteristics.

One more point made is that the rewasher may be set to recover coal of the same quality produced from the raw coal or to produce a higher ash fuel for separate marketing, as desired.



SUPERINTENDENT Frank Gilbert is in charge of River Queen operation.

CAR HAULS

From the preparation plant the prepared coal will be loaded into the River Queen mine's 100-ton hopper cars. Two car hauls will shunt empties and loaded cars into and out of the loading area. The hauls are equipped with 100-hp DC General Electric motors, one motor to each haul hoist. The hoists' dummy cars, are pulled by 1¼-in Bethlehem wire rope. As a string of empties is pulled in a string of full cars will descend the 1½% grade area where they will be picked up by a diesel for the 6½ mi run to the Green River barge-loading facilities.

BARGE LOADING FACILITIES

Like most of the River Queen mine facilities the loading dock on the Green River 6½ mi distant is still in an early construction stage. In fact, during the week of unveiling the River Queen shovel last month a dragline had just begun to develop the loading channel, or slip. When construction finally ends, however, the river dock will accommodate 16 barges along its 1,050-ft length. Loading will be accomplished at a 1,000-tph rate with loading equipment nearly identical to that used at Peabody's Gibraltar mine (*Coal Age*, October, 1956, p 60). The barges will be belt-loaded, but coal will arrive from the mine on 100-ton hopper railroad cars. The cars, 30 on each trip, will be pulled by a diesel being bought from the Mississippi Kansas & Texas RR Co. The River Queen Co. has a diesel-powered locomotive on order from General Electric Co., but delivery is not expected for 1½ yr.



CONTINUOUS MINING—Alex Grant (left), Buckeye Coal Co., floor committeeman; G. B. Southward, Julian Conover, and Howard Young, American Mining Congress; A. R. Matthews, Pittsburgh Consolidation Coal Co., chairman; J. H. Sherrard, Johnstown Coal & Coke Co.; R. T. Blakley, General Electric Co.; Ben Tudor, Clinchfield Coal Co.; R. D. Joseph and E. M. Thomas, USBM.

AMC Coal Convention Report: Efficient Mining Today

Forty-four industry leaders in mining, stripping, preparation, maintenance, safety and training present today's experience and indicated trends at American Mining Congress Show, Cleveland, May 13-16.

Continuous Maintenance

"A continuous mining maintenance system from the face

to the railroad car must be provided to insure against interruption of the continuous mining process."

After a description of the Lower

Freeport and Sewell seams J. H. Sherrard Jr., chief engineer, Johnstown Coal & Coke Co., Portage, Pa., noted that the company's mines employ Jeffrey 76-A and 76-AM Colmols followed by Joy 12 BU loaders. Piggyback conveyors dump on Long crawler-mounted heads. Transportation to the preparation plant is by belt conveyor and mine cars. Both Fletcher hydraulic drills and Cleveland stopers are used to bolt top.

He offered a series of plans and controls to improve the maintenance service as follows:

1. **Training**—To provide competent personnel for the operation of the system.

2. **Breakdown Repairs**—To provide the easiest, most complete and fastest method of restoring equipment to operating condition during a production shift.

3. **Initial Preventive Maintenance**—To make additions or deletions on all new or overhauled equipment to improve all phases of operation.



MANAGEMENT AND SAFETY—W. A. Gallagher (left) Stonega Coke & Coal Co., floor committeeman; L. C. Campbell, Eastern Gas & Fuel Associates, chairman; J. F. Whittaker, Pittsburgh Coal Co.; C. B. Ferguson, UMWA; G. W. Lockin, Inland Steel Co.; C. R. Nailler, Christopher Coal Co.; F. E. Snarr, Freeman Coal Mining Corp.; J. Hyslop, Hanna Coal Co.; H. E. Mauck, Olga Coal Co.



STRIP MINING—W. J. Rude, Central Ohio Coal Co. (left), chairman; L. E. Briscoe, Ayrshire Collieries Corp.; B. E. Rector, Westinghouse Electric Corp.; R. L. Rectenwald, Maintenance Engineering Corp.; B. N. Carlson, American Steel & Wire Div., U. S. Steel Corp.; Emil Sandeen, Pittsburg & Midway Coal Mining Co.; and Andrew Hyslop Jr., Hanna Coal Co., floor committeeman.

4. Complete Preventive Maintenance—To insure that each piece of equipment operates at maximum efficiency for as long a period as possible, to prohibit its continuance in operation after it has reached a predetermined minimum efficiency, and to restore the equipment by overhaul to the condition resulting in maximum efficiency.

5. Supply Maintenance—To provide for adequate repair parts and assemblies and for control of maintenance supplies cost.

In his summary, Mr. Sherrard listed seven items essential for an effective maintenance program for continuous mining.

1. Exercise the controls provided to reduce maintenance required to a minimum.

2. Compare individual repair jobs with others of similar nature for evaluation of method, time, materials used and effectiveness.

3. Determine need for overhauls and evaluate effectiveness systematically.

4. Know the total cost to the company of each breakdown and repairs, both major and minor, and emphasize the most expensive until its cost is eliminated or materially reduced.

5. Determine the most durable repair parts obtainable and use them to obtain maximum life.

6. Provide necessary repair parts as near as possible to their point of expected use for most effective use of material.

7. Help evaluate training.

The basic premises of a continuous mining system at Johnstown Coal & Coke are that equipment and methods will be employed which will assimilate into one process, as nearly as possible, all operations necessary to penetrate the mineral body as rapidly as possible and that the process shall be uninterrupted in time and sequence.

AC Power

"Experience gained while operating both AC and DC

continuous miners indicated that the AC system afforded the most economical and productive operation for the Sunnyside mine."

W. C. Wright, superintendent of maintenance, Kaiser Steel Corp., Sunnyside, Utah, described, with the aid of slides, the outside and underground distribution system employed at the Sunnyside mines.

The paper was presented by R. T. Blakley, General Electric Co., Salt Lake City, Utah.

Power is received at 44 kv through a central metering station. From this metering station it is distributed at the same voltage to three substations, one for each mine. Each substation transforms the voltage to 4,160, the primary distribution voltage for the mines. Total transformer capacity for the three mines is 9,350 kva divided as follows. No. 1 mine, 3,000; No. 2, 1,600; No. 3 mine, 4,750 kva. The substation for the No. 3 mine also supplies power to the townsite and the preparation plant. General protective equipment for each substation consists of lighting arresters, airbreak and fuse disconnect switches on the 44-kv line, and automatic reclosing oil circuit breakers and lightning arresters on the mine feeder lines. The new installations incorporate tap-changing under load or induction-type voltage regulation equipment on the mine feeders, Mr. Wright explained.

Underground distribution is done at 4,160 V through 4/0 rubber-covered primary cable. One cable supplies the power to the main hoist and a separate cable supplies the working sections of the mine. This latter installation follows the intake air from the surface to the bottom of the slopes.

Section power is obtained by tapping the 4/0 source at each working level with a No. 6 rubber-covered cable. This No. 6 line extends from the main slope to the 200 kva 4160-480-V mine load center substation near the working

face. Section feeder cable protection is provided by an oil circuit breaker at the junction of the 4/0 and 6/0 cable. The substation includes a primary oil circuit breaker, a transformer section (4,160 delta to 480 wye), voltage taps, and outgoing cable connectors.

Power for the face equipment is transmitted through 200-ft lengths of 4/0 four-conductor cable to a junction box. The junction box is equipped with separate plug-in connections and circuit breakers selected to protect the trailing cables and the equipment which the cables need. These junction boxes can be omitted by connecting the trailing cables directly to secondary circuit breakers built into the mine load substations.

Both types of mine load center substations are used. However, under normal condition, the use of a junction box eliminates the need for frequent moves of the heavier mine load substation and also permits the use of shorter trailing cables. Section equipment is protected with ground-fault relays. Two types are used, one a selective trip arrangement which only disconnects the trailing cable that is grounded, and the other a nonselective type which interrupts all power from the junction box to the face in the event of a ground fault on any trailing cable.

The AC electrical system was found to have the following advantages:

1. Initial cost is considerably lower.
2. Operator training requires less time.
3. Continuity of production definitely favors AC machine because of less downtime.

4. Maintenance is less on AC machines.
5. Safety of AC systems is superior to DC.

6. Flexibility of power distribution require less time and effort for necessary moves.

In concluding, Mr. Wright stated that the system has proved to be very satisfactory over the last few years, even in the face of ever-increasing production demands and larger power requirements.

Continued on p 90



CONVENTIONAL MINING—C. E. Walker (left), Jewell Ridge Coal Corp., chairman; R. M. Johnson, Island Creek Coal Co.; J. R. Palin, Harmar Coal Co.; C. S. Winters, Powhatan Mining Co.; C. C. Quirey Sr., Pittsburg & Midway Coal Mining Co.; C. N. Van Houten, U. S. Steel Corp.; E. R. Phelps, Pittsburg & Midway Coal Mining Co., floor committeeman.



COAL PREPARATION—George J. Clark (left), Reading Anthracite Co., chairman; E. M. Robinson, Jeddo-Highland Coal Co.; P. M. Richards, U. S. Steel Corp.; H. F. Hebley, Pittsburgh Consolidation Coal Co.; Larry Cook, Ohio Reclamation Association; J. C. Durfee, U. S. Steel, and J. W. Broadway, Bell & Zoller Coal Co., floor committeeman.

Bolting Top in Continuous Mining

"Continuous loading must be followed by a fast, flexible and safe means of roof-bolting."

Roof-bolting practices with continuous mining at Compass No. 1 mine, Compass Div., Clinchfield Coal Co., were detailed by Ben Tudor, mining engineer, Clarksburg, W. Va.

Two Joy RDU 2 roof-bolting drills are mounted on the miner. They are of the auger type and are hydraulically operated. A 26-hp motor and a four-section hydraulic pump serve as the power unit. Each drill operates independently of the continuous miner. The drills are mounted on the crawler frames. A Trunnion supports the entire unit. This trunnion support is designed to let the drills operate 30 deg in toward the miner from vertical position and 24 deg out from vertical.

Drilling and bolting are performed

while the miner is ripping out the coal. As the miner removes the first 18-in cut across the face each roof bolt man installs a vertical bolt. Finishing the first cut and as the miner moves ahead 18 in, the driller on the left side of the machine angles his drill 20 to 25 deg toward the center of the room and installs a bolt on that angle. Following the next advance the driller on the right side installs a bolt angled toward the center. After the third advance both drillers install two vertical bolts.

The complete operation takes an average of 2 min. When considering it takes the miner 5 min to sweep the face, there is enough time existing for each roof-bolter to place two bolts each or four abreast across the roof if necessary.

Roof Support in Continuous Mining

"Replacement of conventional mining equipment by

the continuous miner is affecting virtually all phases of the production of bituminous coal."

Support methods for continuous mining were reviewed by R. D. Joseph, health and safety mining engineer, and E. M. Thomas, mining engineer, project leader, roof control, Bureau of Mines, Washington, D. C. In this presentation, the authors stated that continuous mining has brought with it new safety problems. As continuous mining evolves, it brings into focus the urgent need of planned roof control and support because its use limits the size of the producing area and dependence is often placed on a single opening. It is interesting to note however, that continuous mining has, to date proved itself far safer than any other method of extraction.

The Bureau of Mines conducted a survey during the early part of 1955 to determine (1) the extent to which roof bolts were being used in conjunction

with continuous miners and (2) the general application of the continuous mining machine. At that time roof bolts were being used in 50% of the mines. The application with both the boring and ripping type miners was similar in that a pocket was advanced a fixed distance into the solid. The machine was then retrieved and support installed in the exposed area.

The permanent support plans varied sharply. Roof-bolting was used to the greatest extent because it provides a maximum of face operating space. Usually, the bolting pattern was based on 4-ft centers both across and with the place. Crossbars were bolted in places where the rock beam required reinforcement.

Where timber was used as a permanent support, the usual system was to set a row or rows of props placed equally from both ribs, using the center of the place as the roadway.

Several methods of approach to the roof-support problem were summarized by the authors, including the following.

1. Two-pocket advance with permanent supports installed and maintained from the face a distance equal to the length of the machine to permit maneuvering.

2. A two-place square block system, with bolting on a 4-ft pattern, alternating between places.

3. Advancing and turning intersections, with beams kept within 12 ft of the face and set at intervals of $3\frac{1}{2}$ to 4 ft.

4. Support in rooms and pillars applied as the mining advances. Wood beams used in open-end pillar slicing to strengthen the rock beam formed by bolting. Bolts placed close to the coal pillar.

5. Open-end pillar recovery systems with short roof spans in relatively strong top, relying on the heavy inside coal abutment for extra support, plus cribs or breaker posts set before pillar slicing.

6. Long producing runs with wide roof spans and timber applied as miner advances plus heavy abutments and coal fences, which are not recovered.

Methods such as these, when coordinated with studies of roof behavior, should be the means by which support can be minimized though still adequate for safety.

The Cornering Belt

"Close study of the operation of the continuous miner indicates that while the machine has a very high potential capacity, the output has been limited by the transportation systems used behind the machines."

The extensible belt has a definite application in room work where total extraction is not practiced, said W. G. Kegel, master mechanic, Vesta-Shannopin Coal Div., Jones & Laughlin Steel Corp. It has a place in entry develop-



Glenn B. Southward Announces Retirement

GLENN B. SOUTHWARD, mechanization engineer, American Mining Congress, formally announced his retirement from active duty at the opening session of the 1957 Coal Show in Cleveland. In making the announcement, Mr. Southward pointed out that one of his first official responsibilities with the congress was the presentation of the results of a mechanization survey at the May 18 session 30 yr ago. This survey showed some 40 mines using machines, with others coming into the picture.

A practicing mining engineer prior to joining the congress staff—supposedly for only 3 mo—Mr. Southward's earlier contribution had included development of the V-system with Movor conveyors, which went into operation at the Norton mine, in West Virginia, in 1923.

ment, where it aids in the elimination of delays in operating time and the lowering of labor costs for the installation of loading points. When total extraction is practiced and because of shallow cover the size of pillar can be kept small, the extensible belt also has found application.

The possibility of adapting the extensible belt to a continuous miner without the use of auxiliary equipment led to the development of the 90-deg turn by J & L. A series of shop trials were made to develop the proper construction features for successful underground operation.

In actual mining, the turning of a working place posed some problems, Mr. Kegel said. Before the turning device can be set, the extensible-belt tail piece has to be moved into the newly developed working place far enough to clear the turning device. This requires about 22 ft from the center line of the original heading.

A standard bridge conveyor is not suitable for the job because it can be extended or retracted only 8 ft. To pro-

vide the necessary distance, the tail piece was redesigned to permit the bridge conveyor to move back over the full length of the main body of the tail piece. By using a 15-ft bridge unit, Mr. Kegel said that it could be moved back until its inby end was even with the inby bumper of the tail piece.

Since it was also necessary to uncouple the bridge conveyor from the miner discharge conveyor, a roller was installed near the inby end of the tail-piece to serve as a rest for the bridge.

These changes permit a turnout to be driven from 45 to 50 ft from the center of the original heading. By contracting the equipment, the necessary space to set up in the new heading is made available.

In December, 1956, a complete unit was installed in the Shannopin mine in a three-heading system. The right heading serves as a beltway and crosscuts are cut to the left on 100-ft centers. Mining procedure is as follows. Drive the right heading 100 ft, set left turn and mine across to the left heading. Here right turn was set and the left heading advanced 100 ft. The equipment then was pulled back to the heading, the right turn was reset and the center heading was advanced 100 ft. Again a pullback was made to the belt heading, which was driven 100 ft, and the cycle was repeated.

Early experience indicated the need for a better turn, Mr. Kegel said. As a result a four-cornered reversible turn was developed. Overall height of this unit is $28\frac{1}{2}$ in.

The encouraging feature, said Mr. Kegel, is the short time required for the passage of coal from the face to the mine car. Uninterrupted advances for distances of 50 ft or more are possible, depending on projections and the availability of mine cars.

Continuous Entry Work

"In headings our average production is between 300 and 350 tons per shift, or 37 tons per man. An average of 400 plus tons, or 50 plus tons per man, is mined in rooms."

In describing operations at the No. 2 Gas mine, G. L. George, superintendent, Wyatt Seanor Coal Co., said equipment in entry work includes one Jeffrey Colmol, Joy 14-BU pickup loader, one Long Piggyback and three Long chain conveyors. A distance of 85 ft is needed from the conveyor discharge head to the face to set up the Piggyback, 14-BU and Colmol.

Headings are driven in groups of five with crosscuts on 80-ft centers in the mains and on 54-centers in room entries. Headings are driven 27 ft wide, crosscuts 18 ft wide. Rooms, on 54-ft centers, are driven 36 ft wide with breakthroughs every 54 ft to a depth of 300 ft.

The mining sequence in headings is as follows. The No. 5, or right, heading is advanced 100 ft and a crosscut to the left is made at 54 ft. The Colmol,



CONTINUOUS MINING—J. W. Elkin, Duquesne Light Co. (left), floor committeeman; J. W. MacDonald, Old Ben Coal Corp., chairman; W. G. Kegel, Vesta-Shannon Div., J & L Steel Corp.; G. L. George, Wyatt Seaton Coal Co.; M. M. O'Brien, Pocahontas Fuel Co.; R. M. Biggs, Viking Coal Corp.; and William Laird, Eastern Gas & Fuel Associates.

14-BU and Piggyback are moved to No. 4, which is driven 200 ft, after which a crosscut is made at 108 ft to No. 5. Equipment is then moved back to No. 5 and it is driven 300 ft, after which the unit is moved to No. 4 heading, which is driven to a total depth of 300 ft. The three pieces of equipment then is moved to Nos. 3, 2 and 1 headings, respectively, and each is driven 300 ft without moving out of the place, Mr. George explained. After a cycle is completed, a 270-ft belt extension is made and the sequence repeated.

The cycle for mining rooms is similar to that in headings. Two places are driven 300 ft, alternating from side to side to establish the air circuit. After the first two rooms are driven all remaining ones are driven 300 ft without moving the equipment. A conveyor head is set and panned up ready for work in advance of the current working place. Thus if a move is necessary on the shift, it can be done in about 1 to 1½ hr, Mr. George said.

In advancing a heading, the Colmol makes three passes to make the 27-ft opening. The first run starts on the left side of the place, clearing the centerline 6 in from the right rib and extends 36 ft. The machine is pulled back and all bits are checked and dull ones replaced. While bits are being checked a row of posts is set in the center of the first run. After the second run is made, posts are set and bits checked as in the first run. The third run is made similarly, giving a total advance 27 ft wide and 36 ft deep.

After the third run is completed, the loader and Piggyback are moved back from the face and six pans are installed in the room conveyor. This takes 18 to 20 min. All men help make the conveyor extension.

The face crew includes seven men as follows: one Colmol operator; one 14-BU operator; two face utility men who set timbers, handle cables, water line, rock dust and clean up spillage; one supplyman who uses a T-2 truck to haul all supplies to the face; one electrician; and one foreman.

Shuttle-Car Mining

"Employment of continuous miners has stimulated interest in transportation. In many cases a mine system has grown just like Topsy and does not extend to the face."

In describing continuous miners with shuttle-car haulage at Itmann mine, Pocahontas Fuel Co., Inc., M. M. O'Brien, assistant superintendent, said that Lee-Norse continuous miners were purchased in 1955. The first problem was to adapt them to the system of mining existing at the mine.

In retreat work a flat pillar line up to 625 ft long is maintained with the continuous miners. Pillars are extracted open-end until only a 5-ft stump remains. This is taken in a push-out. In all pillar work four rows of timbers, on 2-ft centers, are set along the gob side.

Several advantages cited by Mr. O'Brien as resulting from a flat pillar line include a decrease in trouble with the bottom and balancing of shuttle-car haul distances. By eliminating the point of a conventional angled pillar line the company has shortened the haul distances and the roads hold up better as a result of the change.

To reduce the waiting time and to take advantage of the high production rate in pillars, the company has added a third shuttle car. This unit also is available for supplying. On the subject of production, Mr. O'Brien said that the Lee-Norse miner produces at the rate of 3.5 to 5 tpm. On a monthly basis, output has ranged from 12,000 to 21,000 tons and averaged 16,000 tons. Productivity averages 33.8 tons per man per year and has been as high as 40.9 tons per man. These figures are on a clean-coal basis. In conclusion, Mr. O'Brien said that the Lee-Norse miner and shuttle cars make a good, flexible, high-production team for pillar mining at Itmann.

Continuous Mining in Adverse Conditions

"The natural physical conditions in the Viking mine are unusual and are typical of but one locality in the U. S. coal fields."

Mining conditions at the Viking mine are not very good, said R. M. Biggs, electrical engineer, Viking Coal Corp., and the Indiana No. 5 seam contains sulphur balls in unpredictable locations and quantities. The roof is full of boulders that protrude 8 to 10 in into the coal seam itself. Soft fire clay bottom slows the movement of equipment. Aside from the unfavorable natural conditions, Mr. Biggs said that in some sections of the property the Nos. 3 and 4 seams have been extracted under the No. 5 bed. This creates a hazardous condition since both of the underlying beds have caved and the strata, including the No. 5 seam, are broken. Sometimes the No. 5 seam has dropped as much as 2 or 3 ft.

In describing mining results with a Jeffrey Colmol, 14-BU loader and two 6 SC shuttle cars, Mr. Biggs said that production averaged 257 tons per shift in the month of March, 1957, or 28.5 tons per man. Rooms are driven 18 ft wide on 60-ft centers and pillars are recovered. One side of a room panel is mined on advance and the other on retreat. Bit cost is \$0.121 per ton as compared to \$0.088 per ton for a conventional cutter.

"The present plan of mining and sequence of operations came through study and experience."

Clay veins, slips, sandy shale faults and massive sulphur balls have been encountered in the Pittsburgh seam at the Federal No. 1 mine, Eastern Gas & Fuel Associates, said William Laird, superintendent. In one entry 60 different inclusions were encountered within a



STRIP MINING—G. E. Sorensen (left), The Kemmerer Coal Co., chairman; Fred Horne, Peabody Coal Co.; C. C. Woolsey, The Enos Coal Mining Co.; D. W. Mogg, Great Lakes Carbon Corp.; T. G. Gerow, Consultant; R. E. Dougherty, Tasa Coal Co.; H. H. Hughes, J. Robert Bazley, Inc.; and W. H. Moore, Susquehanna Collieries, floor committeeman.

distance of 1,800 ft as it was developed with a Goodman continuous miner. Bit cost was \$0.0114 per ton.

Federal's present mining plan, developed through study and experience, calls for three headings on 72- and 78-ft centers. Breakthroughs are angled 60 deg and staggered 30 ft apart. Belt moves are made for each 166 ft of advance or retreat.

The mining sequence in driving entries is as follows: The No. 2 heading is advanced 30 ft, then the machine drops back and drives the right breakthrough to No. 3 heading and advances No. 3 about 85 ft. The machine is pulled back through the break to its initial point in No. 2. Then No. 2 is driven 55 ft after which the machine pulls back and cuts a breakthrough left to No. 1 and continues driving No. 1 85 ft. This procedure is repeated again on the right and left, thus providing room for the belt to be extended, Mr. Laird said.

A typical continuous miner butt entry, Mr. Laird said, is 2,600 ft long. Rooms are driven off the No. 3 heading on 83.1-ft centers and to a depth of 280 ft. Pillar lifts are driven parallel to the rooms, permitting the operator to remain in the clear and along the solid side. A 4- to 5-ft fender between each lift protects men and equipment. Production records show that one entry had a life of 119½ days and yielded 179,274 tons of coal. This is an average of 1,498 tons per day, 499 tons per shift and 60.7 tons per man. Bit cost was 2¢ per ton.

Drilling and Blasting Overburden

"To cope with a variety of overburdens the Peabody stripping operations are using or have used numerous drilling systems. These include vertical horizontal and combinations of vertical and horizontal."

Vertical drilling, Mr. Horne said, is done against an open highwall and against a buffer. Horizontal drilling is varied by sometimes drilling every other hole with an upward angle, or by drilling an upward hole directly above the horizontal hole. Combinations of vertical and horizontal drilling consist of full rows of full-depth vertical holes drilled behind a row of horizontal holes, or a pattern of partial-depth vertical holes drilled directly above a row of horizontal holes.

Mr. Horne said the advantage of vertical drilling and shooting against a buffer are:

1. Large chunks of rock are eliminated.
2. The long toe that cannot be shot is eliminated.
3. The drill never works close to the edge of the highwall.
4. A uniform drilling pattern can be maintained regardless of how crooked a pit is when opened.
5. The drill can be moved about so that areas that are muddy in wet weather can be drilled later in dry weather.
6. Timber and brush can be pushed onto the buffer zone, thus eliminating rehandling.
7. Pit width can be varied without interfering with drilling and shooting.

Regardless of whether auger or rotary drilling is used, there has been almost a complete change in the past few years to large-diameter holes, Mr. Horne continued. A 5-in hole is now the smallest drilled at Peabody's operations. Horizontal augers bore 5- to 9-in holes and a horizontal rotary unit drills 7½- and 9-in holes. With vertical auger drills, holes range from 6 to 9 in and vertical rotary machines are used to drill 10½-in holes. The large holes have made possible the use of bulky and lower-cost explosives some of which cannot be consistently detonated in diameters less than 6 in. Manufacturers have also had a hand in causing the switch to large holes by establishing a price differential on size in certain types of explosives.

On the subject of footage and cost of vertical drilling Mr. Horne cited examples from mines in western Kentucky where bit costs was \$0.0275 per foot and bit life was 10,456 ft, and \$0.0356 per ft and life 7,926 ft. At an Illinois operation, bit life averaged 5,177 ft and cost was \$0.0570 per ft. At a southern Indiana operation bit life ranged from 18,000 to 23,000 ft. Cost ranged from 12 to 16¢ per foot.

In describing a new horizontal rotary drill now in the final stages of development, Mr. Horne said the unit has an overall length of 60 ft and uses a 60-ft drill stem. Using a 9-in bit, the unit can penetrate shale at the rate of 50 in per minute and produce a clean, straight hole.

Turning to explosives, Mr. Horne said that if the term "ammonium nitrate explosives" is considered in the broadest sense to include ammonium nitrate dynamites as well as those made up with various grades of ammonium nitrate reinforced with oxidizable materials, then practically all fixed explosives used in the strip industry can be so classified.

In commenting on the tendency of operators to decrease the cost of expensive primers by using those with less weight or lower strengths, Mr. Horne said that explosives requiring a primer seem to yield results in direct proportion to the quantity and type of initial detonation.

To secure operating data on blasting ratios and resulting costs, Mr. Horne said an analysis was made of the drilling and blasting reports of all of Peabody's stripping operations for 1956. In horizontal drilling and shooting hole spacing varied from 12 to 33 ft and depths from 30 to 90 ft. Banks were between 12 and 82 ft high. Explosives cost per yard ranged from \$0.0084 to \$0.0437.

Vertical hole spacing varied from 12x15 ft to 40x40 ft and hole depths from 10 to 86 ft. Cost per yard ranged from \$0.0135 to \$0.0984. Considering the two methods on a comparative basis, the unit costs of the vertical method normally exceed those of horizontal.



CONVENTIONAL MINING—H. L. Beattie (left), Elk River Coal & Lumber Co., floor committeeman; S. A. Caperton, Slab Fork Coal Co., chairman; J. W. Bassett, West Kentucky Coal Co.; R. E. Spoerl, U. S. Rubber Co.; W. C. Schott, Stonega Coke & Coal Co.; C. C. Conway, Clarkson Mfg. Co.; D. C. Ridenour, Olga Coal Co.

The higher cost of the vertical method is in many cases more than offset by the quality of fragmentation obtained and the overall results of the operation, Mr. Horne explained.

The only remaining operation in strip mining requiring a great deal of physical effort has been mechanized at a southern Indiana mine by installing two machines to load and tamp horizontal holes. These were designed and built at the mine and a patent applied for on the original machine. The basic principle of the unit is that a tamping pole made up of 8-ft sections, connected by specially designed joints, is pushed in and pulled out of the hole by friction, unwrapping from a square reel on the in-stroke and wrapping around the reel on the outstroke, Mr. Horne concluded.

"Tremendous strides have been made in recent years in making LOX safer to handle and use in open-pit blasting"

In describing a new-type liquid oxygen explosive, D. W. Mogg said that one of the most important advantages of the new carbon ingredient is that it makes a very safe explosive without requiring fireproofing. It is low in cost, very uniform, has good brisance and can be made available in unlimited quantities. Developed at the Morton Grove laboratories of Great Lakes Carbon Corp., it is marketed under the trade-mark "Nerex." The carbon is produced from coal by a process which converts the coal into a highly porous carbon. Testing of Nerex has been a cooperative project of the Enos Coal Mining Co. and Great Lakes Carbon Corp., carried out at the Enos mine, near Oakland City, Ind.

The switch to Nerex was made after a 3-yr search for an assured source of another absorbent that would meet the following requirements:

1. Have the safety features of the flameproof char.
2. Be equally efficient in breaking overburden.

3. Cost less, if this is possible.

4. Be available from a supplier who would assure that the company needs would be fulfilled in future years.

Before changing to Nerex, said C. C. Woolsey, Enos drilling and shooting superintendent, an experimental station set up on company property was used by Great Lakes to demonstrate the safety features of the product. Between March, 1956, and October 1, 1956 the mine used 221,046 lb of Nerex in various types of rock and in banks ranging from 50 to 89 ft high.

Savings to the company through using the new-type absorbent are:

1. Cost of carbon reduced 2c per lb.
2. Cost of phosphoric acid eliminated, saving about \$10,000 in 1955.
3. Lower labor cost in making cartridges.
4. Saving in bag cost.
5. Saving in liquid oxygen, because fewer boxes of explosives are required as a result of the increase in explosive per cartridge.
6. Saving in shooting labor.

Overburden Removal

"What place does the new 60-yd shovel have in the coal stripping picture today? Have stripping shovels reached their limits?"

In reply to the first question, T. G. Gerow, mining consultant and engineer, Chicago, said that two 60-yd machines are now a reality and at least five more are reported on order. The 60- to 70-yd machines represent a large capital investment. Interest and depreciation will be about \$250,000 per year or slightly over \$1,000 per operating day. Hence, care must be exercised in their application. Regardless of the size and cost, there is a growing need for the big machines to meet heavier overburden conditions and move material more economically. They will find their application in both new developments and existing operations, Mr. Gerow said.

On the subject of future machines, Mr. Gerow said that they probably will become bigger and better. Operators are looking for more capacity and more range. Shovels give capacity and drag-lines give range. But both are not now a prime mover. The wheel excavator gives both range and capacity but it is limited to favorable overburden and it is not a prime mover. It must be used as an auxiliary unit. There is a need for a prime mover that is a continuous stripper so that the scope of operations can be expanded and costs reduced. Underground operations are competing with continuous miners and strip operators need a continuous stripper too, Mr. Gerow said.

In conclusion, Mr. Gerow said the 60-yd shovels have already taken their place in the strip picture and will find more applications in both new and existing operations. Increased capacity and range also can be expected.

"The need for small and medium size stripping equipment is not passé in spite of the ever-constant drive for additional yard-moving capacity. Since most of our thinking is directed toward cost per unit of production, it is well to consider the needs of a particular job in relation to over-all efficiency and cost rather than a generalization of increased dirt-moving capacity."

There is a need and a specific application for small and medium size machines, said R. E. Dougherty Jr., vice president operations, Tasa Coal Co., Pittsburgh. The size of equipment selected for strip mining is usually determined by the following: (1) acreage of strippable coal, (2) operational mobility, (3) local topography, and (4) operational balance.

The cost of purchasing, moving and

erecting a stripping machine sets an economic limit to the expenses that can be incurred in planning an operation. It is desirable to amortize equipment during the life of an operation, but this is not always possible. Where it is not feasible, medium and smaller-size units have the added advantage of low cost in moving to another location.

Mobility of equipment is important in acquiring new coal reserves. The ability to move equipment to smaller, more dispersed tracts of coal is an important advantage of the smaller stripping equipment, Mr. Dougherty said.

Regardless of available acreage and mobility of equipment, it must be applied properly. Frequently in hillside stripping the overburden increases so rapidly in relation to the width of cut that large shovels reach or exceed the economic limit of mining. Medium size machines often perform better in this type of topography, Mr. Dougherty remarked.

It is often practicable and economical to vary production by adding a small or medium-size shovel or dragline. Without a large capital expenditure a smaller unit can be profitably used to remove thin cover and a large shovel or dragline for handling the thicker cover. This setup provides flexibility.

To illustrate many of the factors favoring the use of small and medium size units, Mr. Dougherty described conditions and methods at Tasa's Peerless mine, near Summersville, W. Va. *Coal Age*, August, 1956, p 88).

"Although the role of the bulldozer and scraper units in coal stripping has in the past been primarily that of an auxiliary unit, conditions now exist where the economics of bulldozer and scraper operations can be justified."

Where available draglines cannot handle overburden in one pass, the high-speed rubber-tired scraper has been well accepted in removing the top material and thus relieving the dragline. Once loaded, the scraper can haul a considerable distance at little added cost. And it is a much cheaper method of removal than a shovel with trucks, said Harry H. Hughes, general superintendent, J. Robert Bazley, Inc., Pottsville, Pa.

Three factors that contribute to efficient scraper operations are:

- (1) plan the loading area so that the scrapers are loading on a downhill grade;
- (2) maintain good haulage roads; and
- (3) have the dumping area in good condition so that the load can be ejected at a fair rate of speed.

On the subject of maintenance Mr. Hughes said that the same principles apply as to other mechanical equipment, but a few items need special attention. First, good cutting edges should be maintained on the scrapers. Second, operators should hold the apron at the proper height while loading to avoid damage.



COAL PREPARATION—W. D. Engle Jr. (left), Ingle Coal Co., and session chairman; L. A. Updegraff, Bituminous Coal Research; J. M. Bishop, Truax-Traer Coal Co.; A. P. Massman, Peabody Coal Co., and E. R. McMillan, Northern Pacific Railway Co.

A misshaped apron permits load leakage onto the haulage road with possible resultant tire damage. Third, a light channel section welded across the top of the scraper at the front end prevents the sides from bulging and does not interfere with loading.

The bulldozer employed as a pusher should be large enough, have a torque converter for ease of power application and have the blade motivated by cable action. The development of the hydraulically operated ripper mounted on a large bulldozer or the push dozer has increased the scope of scraper activity. Shales and soft rocks that previously resisted loading by scrapers or ripping with old-type rippers are now successfully loosened, Mr. Hughes reported.

As an example of scraper activity in an anthracite stripping, Mr. Hughes reviewed the operating plan at the Logan Mammoth Vein stripping of J. Robert Bazley, Inc. There the stripping includes removing overburden from a seam of coal lying in a basin. The operational plan included removing overburden and coal and then backfilling to support the railroad and highway, Mr. Hughes said.

Strip Power Systems

"A portable power system using cables permits the operation of equipment a greater distance from the source of power than when overhead lines were used."

Portable strip mine equipment has increased in size immensely in the past 30 yr, said L. E. Briscoe, Electrical engineer, Ayrshire Collieries Corp., Indianapolis, Ind. Therefore the requirements from the electrical power system have expanded accordingly. In many instances portable cables in lengths of 1,000 ft or more have replaced the overhead line.

Public utility companies supplying strip operations are faced with the problem of greatly increased demands on their systems. Frequently they have been able to take care of this by changing to higher voltage transmission lines. Large consumers can get a more favorable contract provided they take power at the higher voltage. This requires the purchase by the user of the transformer substation stepping down the voltage from the relatively higher voltage to that required for the portable equipment, Mr. Briscoe said.

In many instances, energy is now received at 33,000 or 66,000 V and is metered at these values. Thus the user builds the higher-voltage transmission lines from the metering station to the portable substations located near the area to be stripped. As examples of power systems in use today, Mr. Briscoe described the systems at four mines of Ayrshire Collieries and subsidiaries.

In conclusion Mr. Briscoe said that one should not get a false impression from the parallel v. single-transformer portable power distribution systems. The advantages of a parallel system appear only when there is a large physical distance between them. In the author's opinion, analysis by his company prove conclusively the advantage of parallel operation of transformers for portable power distribution systems for strip mines. The advantage became more pronounced as the equipment increase in size. One real advantage is the possibility of continuing to operate at reduced capacity while one transformer is out of service.

"In the layout of a distribution system there are three primary factors involved."

The system must be capable of supplying the load equipment without objectionable voltage regulation from an operating standpoint and at the same time stay within reasonable economic limits. Second, the system must provide

adequate standards of safety for both personnel and equipment. Third, the units comprising the system must be adaptable to relocation to keep up with the change in load requirements.

Primary considerations said B. E. Rector, manager, engineering department, Westinghouse Electric Corp., Pittsburgh, involved in the selection of a protective grounding system include the following:

1. The maximum value of machine frame to ground voltage during a ground fault.
2. The magnitude of fault impedance that can be relayed.
3. Provisions for checking or monitoring continuity of the ground wire circuit.
4. Establishment of a protective ground separate from the substation ground.
5. Proper choice and rating of components to maintain low frame ground voltage in event of failure to trip on a ground fault.
6. Immediate isolation of a faulted feeder from the remainder of the system.

Field Maintenance

"Anything built from man-made materials can also be rebuilt or repaired by manual skill and ingenuity."

Rejecting the statement that it can't be done, R. L. Rectenwald, president, Maintenance Engineering Co., Pittsburgh, said that his company is dedicated to the development of the skills and facilities to effect the restoration of costly and critical industrial equipment rendered useless through accidental wreckage, abuse or normal wear.

The approach to the repair of any damaged machine is first to determine the cause of failure, if not caused by an accident. In his company's search for facilities and inspection tools, Mr. Rectenwald said that it was learned that a combination of three inspection methods will usually provide all the information required to test for fractures and internal flaws and to determine the quality of the repair. The basic methods of inspection are magnetic particle testing, penetrants with whitening and ultrasonics.

After a complete analysis of the failure has been made and the practical and economic aspects have been satisfied, the most desirable repair procedure is determined by evaluation on the basis of strength, material to be repaired, field location, application of heat, weldability and cost.

The matter of restoring machined surfaces and alignment must also be considered along with the joining method. To facilitate machine work on location, Mr. Rectenwald said that his company has portable boring, planing and milling equipment and internal and external hones. These machines are built in sections which can be shipped and handled with crane facilities.

Mr. Rectenwald then described the various techniques used by his company, including the Mecostitch, or mechanical

suture, method of joining hard-to-weld materials, such as, cast iron and some steel sections; bronze welding; and cyclic welding, which is not limited in the mass of weld deposited or thickness of members joined.

In conclusion Mr. Rectenwald said that a new plateau in the development of metal joining had been reached and a wide range of application lies ahead in the fabrication and repair of heavy welded sections. There is no limit to the mass of metal which can be deposited successfully by the cyclic welding method and the suppliers of weld materials and equipment have developed a wide range of excellent products. Development of all-position semiautomatic welding machines will further reduce the cost of cyclic welding, which already is less than the cost of thermit welding.

Extending Rope Life

"Wire rope is only one of the working parts of an excavating machine and consequently its performance is affected to a great extent by the condition and performance of other working parts with which it comes in contact either directly or indirectly."

It is entirely logical that any program of wire rope inspection and maintenance should be matched with a program of inspection and maintenance of those machine parts which affect wire rope service, said B. N. Carlson, chief wire rope engineer, American Steel & Wire Div., U. S. Steel Corp., in opening his discussion of inspection and maintenance of wire rope. Continuing, he said that proper maintenance of wire rope should start even before the rope is placed in service because the benefits of excellent equipment maintenance can be nullified by careless handling and storing.

In strip operations it is essential to make periodic inspections of all wire rope if accidents are to be prevented. These inspections should be frequent enough so that any change in the condition of the rope will be found before it becomes dangerous. To improve rope life, the inspection results must be studied and translated into an effective maintenance program. In making a rope inspection, Mr. Carlson said the following items should be observed:

1. Lubrication.
2. Amount of wear.
3. Distribution of wear.
4. Localized wear.
5. Number of wires broken.
6. Distribution of broken wires.
7. Location of broken wires.
8. Condition of wedge socket.
9. Damage.
10. Corrosion.

It makes little difference if abuses occur as a result of improper handling and storage, or careless equipment maintenance. They reduce wire rope life.

Conversely, the correction of abuses and the prevention of corrosion have a noticeable influence in extending wire rope life.

Strip Mine Maintenance

"I think that most everyone is aware of the fact that good maintenance and the facilities to perform it are essential to any type of production. A good preventive maintenance program is the keynote to automatically lessen the number of breakdowns that otherwise would require all of your maintenance facilities."

With a stripping combination of a 10W dragline and a 950B shovel moving some 14,000,000 cu yd of overburden annually, L. E. Sandeen, Superintendent Pittsburg & Midway Coal Mining Co., Hollowell, Kan., said that maintenance cost is 4¢ per cu yd. Since a 770B 20-yd unit was added in January, cost per yard has been 2¢. Maintenance delays have been 7% of the possible digging time. Carrying out a perpetual preventive maintenance program on the machine is rather difficult because of the inaccessibility of the working areas. As a result it is necessary to give each machine a thorough check on idle days. Knowing the approximate rope life, hoist ropes are changed before they break, thus eliminating danger of a serious breakdown as well as loss of production.

"We find that spare units are a very good investment," Mr. Sandeen continued. Normally only seven of eight 40-ton coal haulers are in service at one time. This leaves a spare which is available if it is necessary to make a mechanical adjustment or change a tire. The spare also gives ample time for major maintenance for the remainder of the fleet without having to pay workers overtime. Three men make up the truck-maintenance crew. A master mechanic looks after the engines and their mechanical components. A second man takes care of oil changes, filter changes and checks tires. Effectiveness of the tire-inspection program is proved by a record of only two flat tires since 1951. The third man keeps all units lubricated and keeps close watch for indications of mechanical failure. To further aid the preventive program, Mr. Sandeen said his company maintains the best all-weather roads possible.

To complete the maintenance setup, Mr. Sandeen said that his company has an electrical department capable of handling any electrical emergency. This department keeps a complete card file on all motors, including operating time, and a maintenance record. The chief electrician's knowledge of the life expectancy of a heavy-duty motor has resulted in only 0.4% delay time since 1951.

All spare parts can be repaired in the

company's machine and welding shop, Mr. Sandeen continued. Parts that are not practical to rebuild or repair are kept in the supply room. To speed field repairs there is a mobile unit equipped with one electric and one gasoline-driven welder plus a supply of welding rods, oxygen, acetylene, torches and soon.

Mechanizing Thin Seams

"The greatest problem connected with thin seam mechanization has been adapting equipment to fit the seam and still operate efficiently."

How equipment and methods have evolved into the present system at Island Creek Coal Co.'s No. 3 Elkhorn mine, Breathitt, Kentucky, was described by R. M. Johnson, manager, Rockhouse Div., Ragland, W. Va.

Due to the success of mobile loading into shuttle cars in adjacent areas, this type of mining was used with the latest low-vein equipment available when operations were started in 1950. It was quickly found that extremely adverse roof conditions made this type of mining impossible. The mobile loading equipment was removed and the latest type shaker conveyors with duck-bills were installed. There was a marked improvement in production because of the ability to control the adverse roof better through the use of cross bars and steel jacks in the face area, followed up with wood posts outby.

Although the shaker conveyor equipment brought improvement in production and cost, it was insufficient to keep pace with the economic changes in the industry. After experimentation, the mine was converted completely to its present system of mobile loading onto chain conveyors over bridge conveyors. This system produces an average of 25 tons of material per man, with some units producing up to 35 tons per man.

A standard cycle of face operations is used on all units. The loader crew, after loading out a place, will park the bridge conveyor outby the last open breakthrough and tram the loading machine to the adjacent place. They then bring the roof-bolting machine from this new place back, and the helper sets 30-in roof bolts on the right side of the place while the operator sets bits in the cutting machine. Operations are stopped when coal is shot in the next place. The crew goes to the next place, attaches the loader to the bridge conveyor and trams to the face and begins loading.

Plans for future improvements of this type of mechanized mining at this operation open up excellent opportunities for further expansion of productivity and cutting costs. The full potential of the high-capacity mobile loading machine has not been obtained due to high percentage of time lost in face preparation. The mechanized thin-seam coal mine of the future can be expected to eventually surpass the thick seam coal mine production rates of today.

Large Mine Car Haulage

"All factors that might affect cost of construction and operating labor and supplies should be considered before a decision on the type and size of car is made."

J. R. Palin, chief engineer, Harmor Coal Co., Library, Pa., offered the following installation factors in developing systems for mine-car haulage:

1. Compare the quantities of excavation and concrete required for car hauls with rotary dump pits and bottom dump cars.
2. Evaluate machinery costs for both installations.
3. Estimate the amount of new track work for both types.
4. Decide on the physical size of the car that can be adapted to the mine.
5. Consider the surge capacity of the cars.
6. Compare the cost per car.
7. Estimate the maintenance cost of the cars including rotary dump and car haul.
8. Consider all phases of each installation.

After comparing the cost of rotary and bottom dump cars the Harmor mine decided to purchase bottom dump cars on the basis of the savings in capital charges and variable costs. The total capital charge for the bottom-dump cars was \$915,000 compared to \$940,000 for the rotary dump type.

The underground transportation system includes 80-lb electric-welded rail laid on 5X7-in treated ties on 22-in centers, ballasted with $\frac{3}{4}$ x1 $\frac{1}{2}$ slag. Secondary track is laid with 40-lb rail on No. 5-section steel ties with depressed ends. Looped loading-point track is laid on the section for trip changes at the car-loading points. Haulage from the five producing sections is done with two locomotive crews per shift. Crews consist of two men, each man operating a 13-ton locomotive. These crews change trips at the loading points, haul to the bottom and dump the cars. A locomotive is used on each end of the trips. This eliminates locomotives running around trips at the dump.

In the future, as the haul becomes longer and single crews can no longer gather haul and dump, a larger mainline locomotive will be used.

High Speed Mine Haulage

"A prerequisite to attaining high-speed movement of coal to the nearest optimum is synchronized operation of all units concerned with any particular mass of coal to be handled."

Modernization of the haulage at Powhatan No. 1 mine in Eastern Ohio was undertaken when it became evident that

the system then in use was inadequate, costly and very impractical for an increased tonnage, said C. S. Winters, superintendent. The program set up and still in process of being carried out involved new cars of greater capacity, some increase in haulage speed, new dumping facilities and a general overhaul of the motor road.

Much consideration had to be given to the purchase of new equipment that could be made adaptable to clearances in existence without excessive or costly modification of the haulage already in use. An 8-wheel steel car weighing 2 $\frac{1}{4}$ tons with a capacity of 395 cu ft was chosen.

Two 26-ton 360-hp locomotives were purchased at the same time. These locomotives have a speed of 20 mph or more. They haul primarily from the dumping station to a passway 2.8 mi inside the mine. Six intermediate locomotives, 10 and 13 tons, gather and deliver to the mainline passway.

With the larger capacity cars and locomotives to match a decided savings was brought about immediately. The two 26-ton locomotives replaced five 13 tonners. Within another year, greater savings of time and cost will have been achieved. The extreme haul, which is now about 7 $\frac{1}{2}$ mil, will be cut to 6 $\frac{1}{2}$. Three less loading stations will be needed which will greatly facilitate the turnover of cars.

Maintenance As A Tool

"Maintenance has emerged as a key element in the production team."

Tennessee Coal & Iron Div, mines of the U. S. Steel Corp., in Alabama, have been mechanized to meet increased demands for greater economy. In mechanizing, they have been faced with a maintenance problem. C. N. Van Houten, superintendent of maintenance, reported that as a result the general maintenance program has been set up to provide the following:

1. Provide personnel on each operating section to take care of minor repairs and adjustments.
2. Provide underground shops to take care of heavier repairs and to maintain miscellaneous equipment throughout the mine.
3. Provide a sufficient number of spare operating sections to permit scheduled shutdowns of regular operating sections for general repairs.
4. Provide surface shops for maintenance of surface facilities and for complete overhaul of component subassemblies and entire machines.
5. Provide other miscellaneous services which will reduce delays to a minimum.

TCI has set up a training program which has proven very successful. Selected groups voluntarily attend a company-sponsored maintenance school one day each week. A full-time instructor is employed to conduct the course. The students receive a full day's pay for attending classes, but are required to

pay, through a payroll-deduction plan, for special text material prepared and furnished by a correspondence school. At the successful completion of the course half of the amount paid by the students is refunded.

"Any maintenance program is just so many words unless there is a vigorous and spirited organization to back it up. This applies to operating personnel as well as to maintenance people."

AC Power Underground

"Feature of underground operations at DeKoven as AC power and the feature of overall operation is its flexibility."

Pittsburg & Midway Coal Mining Co.'s new DeKoven mine, near Sturgis, Ky., on the Ohio River, is designed primarily for river transportation of the mine product, said Courtney C. Quirey Sr., superintendent, in listing other outstanding features of the property, such as, storage of both raw coal and clean coal to make all major phases of operation independent of the others; more than 12,700 ft of surface conveyor belt to transport raw coal to the plant and clean coal to the river; twin circuits in the preparation plant to provide still further flexibility; and primary distribution of AC power at 7,200 V.

Underground methods consist of room and pillar mining with conventional units, including Goodman cutting machines, loaders and shuttle cars, Jeffrey coal drills and Joy roof-bolting drills.

In discussing the AC power system, Mr. Quirey pointed out that AC equipment is lower in cost and easier to maintain, safety devices are more sensitive and face voltage is more constant. Power enters the mine through a 15,000-V mine feeder cable and distributed to five AC substations and a rectifier. The transformer substations are equipped for ground-current tripping through resistors in the secondary circuits. The rectifier, operating in parallel with an M-G set, provides DC power for supply locomotives and the shuttle cars.

The raw-coal storage pile has a capacity of 15,000 tons and the clean-coal stockpile 30,000 tons. A full description of the DeKoven plant appears in this issue, beginning on p 74.

Belt-Conveyor Haulage

"With the high degree of mechanization today, we must have a continuous flow of coal away from the face area."

It is possible, said J. W. Bassett, West Kentucky Coal Co., to have less than 1% down-time from belt delays after belt crews have been completely trained.

The most frequent source of belt delays is overloading of panel belts, Mr. Bassett said, and the best way of cutting down on such delays is through using

a tong-type tester. When such a tester indicates that the motor on a belt drive is overloaded, an inspection will usually show:

1. There is too much belt for grades.
2. The belt line is not clean.
3. Idler rollers have not been properly lubricated.

By combining this testing system with an inspection for bad splices on each shift, 90% of panel belt delays can be eliminated.

Mr. Bassett pointed out that the accident rate attributable to belt haulage is nil. In the past 3 yr, West Kentucky Coal Co.'s Pleasant View mine has had only two lost-time accidents from belt-haulage operations which have pulled 4.5 million tons of raw coal. This compares favorably with other types of haulage which show an accident rate second to roof-fall accidents.

Worthy of special note is the fact that conveyor belts have long service life, Mr. Bassett added. West Kentucky's original 42-in mother belt, purchased in 1940, is still running and is expected to last for another 17 yr. Panel belts, subject to greater abuse, usually last 8 to 10 yr.

Among other advantages, "belt haulage forces supervisory personnel to plan ahead, and thus their ability to visualize what must take place in the future is guaranteed." Also, belt riding from the top to the bottom of the slope is "definitely endorsed" by the company.

At today's prices, Mr. Bassett said that 42-in mother belts cost \$77.15 per ft to buy and install; gathering belts, \$45.50 per ft. Operations and maintenance cost is 20¢ per ton.

"Select your belt system carefully, maintain it properly and it will afford you high tonnage transportation, safety, continuously and profitably."

Belt haulage would not have widespread usage unless it had amply demonstrated low cost, adaptability to a wide variety of mining conditions and haulage distances, ease of maintenance, safety, and extremely long service life.

But many of the inherent advantages of belt conveyor haulage are not fully utilized because of poor maintenance, according to Robert E. Spoerl, United States Rubber Co.

Simply because the conveyor haulage system does not require servicing every shift does not mean that common sense preventive maintenance, good housekeeping, properly designed loading equipment and routine belt repairs should be overlooked.

A major conveyor installation represents a sizable capital expenditure and should be maintained and inspected with the same diligence that is applied to mining machinery, crushers and rolling stock. Diligent maintenance, furthermore, requires careful selection of maintenance crews.

Mr. Spoerl drew special attention to the importance of keeping accurate belt-service records. These allow the belt man to predict tonnage and help him to head

off trouble and work out an efficient inspection-maintenance schedule. Belt service records also are a major aid in proper belt selection because they will indicate changes which should be made in a replacement belt.

Training Mine Mechanics

"Summing up this entire training program, we felt that it was and is the only sound way to procure and develop the right type of men for this training and the only logical way to train them."

The Stonega Coke & Coal Co., Big Stone Gap, Va., has developed an extensive training program for providing mechanics to increase the present mine force and render it capable of rebuilding and reconditioning mine equipment.

W. C. Schott, the company's vice president and general manager, explained that the training program was begun to facilitate the changeover from partial to complete mechanization. About 5 yr ago, Stonega Coke & Coal employed about 3,300 men with 55% of its coal being loaded by mechanical means. Two yr later, 100% mechanization was achieved, bringing therewith a cut in the labor force to 1,300 men and a 37% increase in tonnage to 14,000 tpd.

The cut in the labor force disturbed the age-balance of employees. The older employees filled most of the available jobs through seniority and the younger men were forced to seek work elsewhere. Although the men retained were competent machine operators, a marked shortage developed in the machine maintenance force.

To remedy this problem, a training program combining classroom and shop instruction was announced. Because of the great amount of instruction time needed, it was decided to start with a panel of seven trainees. Each would spend 18 mo in training before assignment as mine mechanics.

The most difficult part was to select trainees from a large number of applicants, some of whom applied from points 50 mi distant. A screening process was set up involving personal interviews and aptitude tests. In this way the initial selection of 50 was reduced to 10. The final selection of 7 gave preference to boys who came from families that were old employees of the company.

Six men were assigned to the rebuilding program at the central machine shop and one man, because of his experience, was assigned to one of the mines. Results of the aptitude tests showed that men with Navy or Air Force training who had high technical ratings generally did best.

Mr. Schott stressed that possibly 15 to 20 of the applicants rejected would and will make excellent maintenance men.

"This program has been in effect 7

mo and results have been about what we anticipated. Every month these men are rated on a point basis by members of our supervisory staff and, at this time, our tests and judgment of the men seem highly justified. We have just recently opened a new mine which will require 10 to 12 mechanics and repairmen. There are practically no trained men available. Therefore, it was decided to use several of the more advanced of our trainees as helpers and give them the necessary training at the source of the trouble, and this necessitated the starting of additional trainees, which were procured by the same methods (described) above."

As time goes on, Mr. Schott said, improvements in the present training program are looked for, particularly in the methods of instruction. For one thing, it is felt that a system of staggering the starting of new trainees will make it possible for older trainees to greatly assist new men.

Aptitude tests will also be used as a criterion for selecting new mine employees to operate mine equipment.

Following Mr. Schott's talk, George Wilson, secretary-treasurer, Illinois Mining Institute, took the rostrum to explore the interest of the American Mining Congress in a proposed plan to interest boys in the coal mining industry.

The core of the plan, Mr. Wilson stated, is to prepare a movie film which will present to the public the opportunities in the mining engineering profession. "We believe that this is the best way to dramatize the need for engineers and to show the process for training them."

The film would cover varied aspects of coal mining work, including coal preparation, mine surveying, construction property appraisal, mine layout and supervision. Copies of this film would be made available to visual aid libraries for use at service clubs, PTA groups and schools.

A-C Face Power

"There seems to be no difficulty in reconciling a D-C system for haulage with an A-C system for face operations, except for the haulage directly from the loading unit."

C. C. Conway, Clarkson Mfg. Co., discussed the problems and advantages of AC power for underground mining operations.

Although trolley haulage must necessarily remain DC, Mr. Conway said, this application is not as far-reaching as it might seem since belt haulage, using principally AC motors, has already taken a share of that work.

There seems to be no difficulty in reconciling a DC system for haulage with an AC system for face operations, except for the haulage directly from the loading unit. It seems desirable not to mix the two systems in serving face and face haulage equipment. Conveyor haul-

age away from the face is, of course, a suitable AC application. And, fortunately, shuttle cars have recently been developed which may be operated with equal success on either AC or DC current.

While the starting of an AC motor requires much more current than a DC motor, the nature of the AC motor makes it less liable to driven-equipment damage and to motor and control damage during starting periods. Torque limitations of the AC motor may well be an advantage when applied to drive mining equipment.

Mr. Conway stated that primary distribution of power in an AC mine would not be too different from the problem of distribution to DC conversion centers, except that with AC there would be more load centers.

While the primary system may not be affected, Mr. Conway cautioned that the secondary system presents, new considerations. AC motors require better voltage distribution and 6 or 7 more times full-load current for starting.

Core Drilling for Ventilation

"Core drilling of large bore holes is still the most economical method of providing ventilation shafts in the No. 4 Pocohontas Seam."

Due to the depth of the No. 4 Pocohontas Seam, the Olga Coal Co., Coalwood, W. Va., has found that costs for core drilling of large bore holes are very high. This type of drilling however, is still the most economical method of providing ventilation shafts.

D. C. Ridenour, the company's chief engineer, stated that the ventilation systems for Olga's No. 1 and No. 2 mines are somewhat unusual for the part of McDowell County where they are located. The pressure system is used with all parts of the mine are above atmospheric pressure. Due to this pressure, bore holes and shafts at the extremities of the property can be used for returns and bleeders without the use of fans at the holes.

The 36-in hole for East Main in Olga No. 1 mine now serves as an exhaust shaft carrying 29,000 cfm of return air to the surface. The net pressure differential between the two ends of the hole, after compensating for the difference in elevation, was 5.3 in. Retreat mining from this area will be rapid due to its shape but regardless of the location of the pillar line, the hole will continue to bleed the gobs and prevent the build-up of a volume of gas underground.

The area of coal in 4 West, Olga No. 2, is similar in shape to East Main and is being benefitted in a similar manner by the 48-in hole, which carries an exhaust of 45,000 cfm.

As an intake or return shaft, the calyx drill hole offers a considerable saving if the size of the hole is adequate to meet the requirements of the mine. The average cost of the two bore holes was

\$115.27 per ft. The cost of ventilating shafts in the area exceed \$500 per ft. While a shaft has a considerably greater air volume capacity, the smaller, less expensive bore holes are adequate for the bleeding purposes for which they were drilled.

There are other uses for this type of hole by the mining industry. One of the most important is the use of 5- and 6-ft diameter holes as manway portals equipped with elevators. This relatively inexpensive shaft-sinking method makes it possible to keep the portal nearer the working faces and, consequently, reduce travel time. Self-service elevators of the Koepe type are available. These are small, compact and easily moved. As many as 20 men are being hoisted at a time in a 6-ft shaft.

It has been found unnecessary to line many of these calyx holes because the smooth sides have not been broken up and shattered by blasting as is usually done in conventional shaft sinking. Where more protection than an enclosed elevator is thought necessary for the elevator passengers, the hole can be lined with a thin steel casing.

Fire Fighting

"The face areas in most of today's mechanized coal mines are vulnerable to mine fires as the intensity of mechanization increases."

Highlights of a discussion of mine-fire hazards and fire-fighting equipment by J. F. Whittaker, Pittsburgh Coal Co., were:

1. The prevention of fires is of utmost importance at any mining operation. In addition to the training of personnel and the employment of circuit breaker protection, a suitable economical nonflammable hydraulic fluid is needed. Much research has been aimed at this development. However, nothing to date has been developed which is economical to use in the mining industry.

2. Improved cables for DC equipment would enhance the safety of operation. New developments in cable construction, believed to be underway, should help on this problem.

3. The possibility of piping certain equipment with spray nozzles directed to vulnerable areas of the equipment should be considered. This is being done by one company in northern West Virginia and probably by others. This development would minimize the possibility of an oil- and grease-fed fire from spreading in inaccessible areas of a machine.

4. In new installations, the use of AC equipment should be evaluated. The general opinion is that AC equipment is more efficient and is less hazardous from a fire standpoint. Also, in conjunction with the use of AC face equipment, diesel locomotives could be employed to transport coal and thereby minimize the hazard of mine fires and gas ignitions. Personal contact hazards

could be eliminated as far as haulage is concerned.

5. At new operations, great protection could be achieved by an installation employing an outside source of water. By piping the entire mine with fresh water, the optimum in fire protection could be obtained.

UMWA Safety Program

"Reaching the man at the face of the coal, in the final analysis, is the only answer to more safety in the industry."

C. B. Ferguson, safety director, UMWA, outlined that group's safety program and pledged the continued full cooperation of his office in reducing roof-fall and other mine accidents to an absolute minimum.

Worthy of particular note was a program now in effect in District No. 29 aimed at reaching the man at the face where the accident problem has become most acute. This program includes the following types of action:

1. Have state and Bureau personnel contact all available management and employees, mining institutes and related organizations on the roof fall problem and ask for their full cooperation and help, particularly on beneficial ideas.

2. Try to get each man in the industry, especially the section foremen and face employees, to understand his duties and responsibilities in preventing rooffalls.

3. Instruct each man that he must comply with all timbering rules and regulations at all times and that this compliance should be part of everyday working habits.

4. When substandard timbering is found during an inspection, have state or federal inspectors get the name of the man or men involved, the exact location and name of the section foreman. Forward this information to appropriate bureau and UMWA offices.

5. As much as possible, arrange for state and federal inspections in the various mines at least a month apart.

6. Suggest and arrange for underground safety sectional meetings to be held weekly or bi-weekly.

7. Insist that federal and state inspectors observe the system of mining more closely, especially the roof support phase.

8. Prepare slides showing fatal roof-fall injury areas and see that this information is disseminated to areas neighboring the mine where the fatal injury occurred. Also have oversize sketches of the fatal injury made for discussing at Holmes meetings and other safety meetings.

9. Make every effort to see that men and foremen know the mining law, code, and company rules regarding roof-control measures.

10. Ask state and federal inspectors to talk to each face employee in the mine about the roof fall record, timbering rules, the danger of working under

inadequately-supported roof, and the need for working in safe areas.

11. Request time at safety meetings, institute programs and other related programs to discuss roof fall preventive measures.

12. Have inspectors make a greater drive to replace conventional roof supports with roof bolts in face areas at as many additional mines as possible.

Mr. Ferguson said that the UMWA is not satisfied with the accident rate, nor with the dispirited attitude of some segments of the industry in making coal mining a safer occupation. And he added:

"We fully intend doing everything possible to bring about improvements in such matters. Perhaps the pace of progress will seem snail-like, the setbacks numerous, but of one thing you can be certain, it must not take a recurrence of major disasters to make it crystal-clear to the industry that there will be no letup in safety education and other aspects of the safety movement."

In discussion, James Hyslop, Hanna Coal Co., congratulated Mr. Ferguson on his forthright statement of UMWA policy and plans on safety. Management cannot escape its primary responsibility for safety, Mr. Hyslop stated. But, in working for maximum accident prevention, management must realize that it cannot achieve its goals without recognizing the valuable and necessary contributions that can be made by the UMWA and all state and federal safety groups.

F. Earle Snarr, Freeman Coal Mining Co., added that foremen must be made to fully understand their responsibilities in safety. They must also know that their authority is backed up by all other supervisory and management personnel.

In further discussion, H. E. Mauck, Olga Coal Co., pointed out that competitive awards have their place in safety but tend to discourage those companies who lose and make them feel "out of the running." It is more important, he said, that companies have an active safety committee which seeks to implement all the components of an aggressive accident-prevention program.

Selecting Personnel By Test

"One way to keep the future of coal mining bright is to increase efficiency not only in better machines, but also in using better men to operate them."

Selection of coal mine personnel through testing was adopted by the Christopher Coal Co., Osage, W. Va., because the company felt that run-of-the-mill, personal judgment techniques, although fairly successful at times, were generally inadequate.

President C. R. Nailler stated that personnel testing and meticulous pre-employment screening has given a

"tremendous boost" to Christopher Coal's batting average in predicting success on the job.

Furthermore, a new supervisor gains a good deal of self-confidence when, after satisfactorily passing the tests, he knows that his success should only be dependent on whether or not he is willing to make the effort to do a good job. Supervisors already on the job realize, too, that their new associates should be as competent as themselves.

"In the case of UMWA employees, we are able to evaluate them pretty accurately as to their basic intelligence, even in those cases where individuals are handicapped by a lack of formal education. A good example of this is the Mechanical Comprehension Test, which requires very little reading ability, yet does a good job of selecting miners who are both intelligent and mechanically inclined. Therefore, we know there are men in our employ who are trainable to meet the rapid changes which are occurring in coal mine mechanization of today, and the even more rapid changes which may occur in the future."

Mr. Nailler cautioned that psychological testing programs for selection of employees seem to have a way of propagating a kind of unthinking reliance on their output. It is possible to accept too readily the "scientific" numerical answer as a substitute for human decisions about people. Even if tests can perform an effective job of selecting men with the right talents for a given position, there is such a thing as putting too much reliance upon them. At all times, practical values of what the particular job requires are of utmost importance and must not be overlooked.

Improving Face Costs

"Method studies appear to be adaptable to mining and very useful in applying the principles of work economy, resulting in reduced face costs."

A procedure for studying work methods of the face cycle is now underway at Inland Steel Co. mines, Wheelwright, Ky. G. W. Lockin, production engineer there, said that this method study procedure is simply a process of geographically or symbolically plotting work procedures for later analysis and the application of work economy principles.

In method studies, time is of secondary importance only. The main object is to plot the sequence of the men's work as accurately as possible and with as much detail as possible. This plotting process is done in the first two or three places or until normal sequence of operation is determined. The time elements are then filled in to the best of the observer's ability in the remaining places that shift. From this, it is possible to arrive at quite an accurate record of the crew's work sequence and a fair indication of time requirements. In obtaining time, either the snap-back or continuous time method can be used.

(Continued on p 150)

HERE ARE JUST A FEW OF THE ARTICLES YOU MISSED

if you didn't get

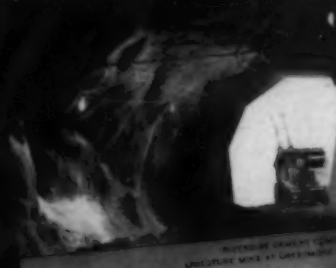
haulage ways

SEPTEMBER 1955

last year!

(A REPRESENTATIVE SELECTION FROM SIX MONTHLY ISSUES)

UNDERGROUND HAULAGE WITH ELECTRIC "Trolley-Trucks"



HOW TO SPEED UP TROLLEY WIRE CONDITIONING

Worner Cid Company's Inducto Blue
Fluxing Bar System a Factor in Fast
Conventional Method



O-B TROLLEY FROGS... HOW TO INSTALL THEM

Simple steps to proper frog
installation...
Type D and MRC



1 HOW TO PREVENT OVERHEATING OF TROLLEY FROGS

1. Proper frog
installation...
2. Proper frog
installation...
3. Proper frog
installation...



Editor
O-B Haulage Ways
Ohio Brass Co.
Mansfield, Ohio

Haulage Ways is an 8-page monthly bulletin
published by the Ohio Brass Co. and sent
free of charge to 8,000 mining men in the
U.S. and abroad.

Dear Ed:

I DON'T WANT TO MISS ANY MORE — SIGN ME UP RIGHT NOW!

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CITY & STATE _____

4810-M

FOREMEN'S FORUM



Careful planning and keeping on schedule are time-tested methods for . . .

Controlling Overtime Labor

Avoid the use of overtime labor whenever you can because the cost is mighty high . . .

But don't forget that some overtime work may be necessary to prevent costlier production losses.

THE COSTS OF OVERTIME LABOR can bite deeply into the modest margin between production cost and selling price at the mine. This is especially true in instances where a number of men are involved in the overtime work. The purpose of our discussion this month is to scout the problem to see if we can make overtime work for you, when you need it, not against you. This, of course, assumes that your company has no blanket rule prohibiting overtime

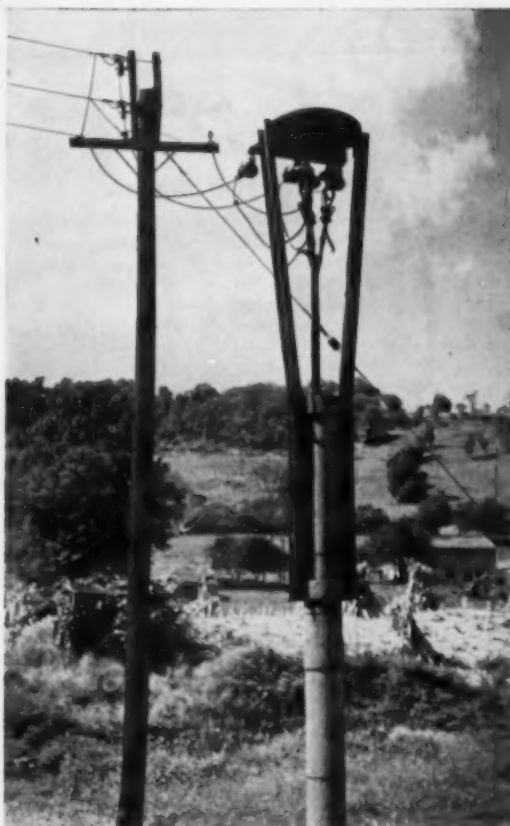
work. If such a rule does exist, your decisions have been made for you.

However, in most cases the riddle of what to do about overtime labor comes down to where the supervisor must answer this poser: "Will the results of this overtime work more than justify its cost?" Now let's look at some examples of how overtime can pay off and how, on the other hand, it might only sour the cost sheet, if you are not careful.

PAYING THE PIPER

If you can't keep your section on cycle you may have to pay for the failure by leaving men after the shift to catch up on rockdusting and so on. Some companies have standard practices that require the off-going shift to leave a good start for the oncoming crew. For example, it may be the practice at your mine to leave a cut of coal ready for loading for the next shift. The time to think about the start you are going to leave for your cross-shift is at the beginning of your own shift. Otherwise, you may have to neglect some of your service work as your shift draws to a close in order to provide the start.

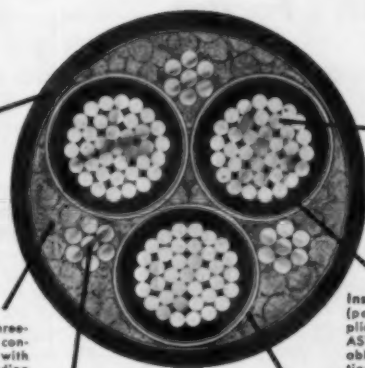
You may hurry through your timbering, or make a "lick-and-a-promise" effort at hanging the last line curtain, or postpone your rockdusting. Then you



Sheath • Rome RoSeal, special black flame-resistant polyethylene, over the cabled and taped assembly—excellent mechanical and electrical properties.

Assembly • Three-shielded power conductors cabled with fillers and grounding conductors.

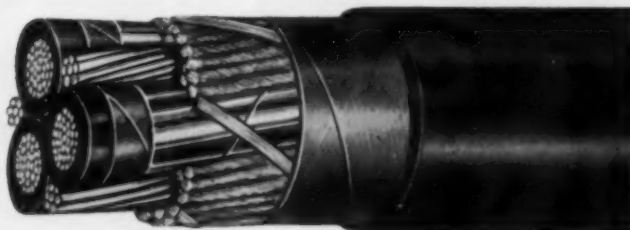
Grounding conductors • ASTM Class B stranded bare copper—one grounding conductor in each interstice in direct contact with electrostatic shielding.



Power conductor • ASTM Class B stranded, annealed bare copper, shielded with a semi-conducting tape.

Insulation • RoLene (polyethylene), complies with IPCEA and ASTM standards—available for maximum continuous conductor temperature of 75°C.

Electrostatic shielding • Bare copper shielding tape over semi-conducting bedding tapes on each insulated conductor.



Rome's mine power feeder cable...

Look at the special features available with Rome MPT—the easy-handling mine power feeder cable.

You get low initial cost, easy installation, and long life. And you naturally get important *safety* features: ground fault protection, a low-resistance circuit in case of shielding failure or ground faulting of equipment, and a flame-resistant jacket.

You can use Rome MPT in boreholes, shafts, trays, aerially, or underground. Sizes range from 6 AWG to 250,000 CM. A three-conductor cable, it's rated up to 5000 volts.

Specify Rome MPT for your next job. For further information, contact your nearest Rome Cable representative—or write to Department 751-B, Rome Cable Corporation, Rome, New York.

1. Costs less—up to 28%. Initial cost is lower than ordinary mine power feeder cables—as much as 28 per cent in the case of 2 AWG 3-conductor rubber and Neoprene sheathed cable 5 kv.

2. Cuts down installation time. Because it's smaller than others—and weighs less—Rome's mine power feeder cable is easier to install. Over-all weight is down as much as one-third. You can cut handling costs, use smaller fittings.

3. Lasts longer. You get a cable with one of Rome's *best* insulations and jackets. This means extra service life is built into the cable. Tough RoLene (polyethylene) insulation and a special flame-resistant RoSeal (polyethylene) jacket combine to give you outstanding resistance to chemicals, moisture, and abrasion.

ROME CABLE
C O R P O R A T I O N

Foremen's Forum



KEEP YOUR CROSS-SHIFT BOSS
fully informed to minimize section
overtime losses.

suddenly find yourself faced with a need to leave a few men in the section after the shift to tie up all these loose ends. You really pay high for service labor like this, and don't forget that one of the marks of high section efficiency is a low service-labor cost.

The obvious solution is to begin every shift with one eye on that "start" you must leave at the end of the day. Concentrate on keeping your unit on cycle. Stress the need for keeping service work in step with face operations. What you do in each hour of the shift has direct bearing on whether you will be able to leave that cut ready for loading without paying too much.

BANKERS' HOURS

The "owl" shift starts at midnight for the specific purpose of avoiding double-time payment for any hours worked before midnight on Sunday. That means the shift must end at 8:00 a.m. We have noted that at a number of new mines the day shift begins at the bankers' hour of 8:00 a.m., thus avoiding conflict between the two shifts.

At other mines the first shift begins at 7:00 a. m. This might lead to complications that would tend to inflate labor costs in relation to production. Here's how: When the first shift enters the section they are bent on producing coal. Since the third shift most likely performs service work they must stand aside or be overrun by the bustle of production. Careful planning may make it possible to get some benefit out of that last hour of the service shift, but the odds are against it.

You may not be able to change the starting time because of all the local problems involved in such a move, but it may be worth suggesting.

MOVING DAY

To the best of your ability try to schedule moves of unit equipment from one section to another with minimum interference to production. But this may be one activity in which the use of overtime labor may be justified. Don't postpone a move just to avoid overtime work. If you do, you may find that on your last shift in the old place you will have to scabble around for coal and not find enough to get respectable shift tonnage.

On the other hand, if you move too soon you leave good coal in the old section, thus wasting the investment in the development work that was done to expose that coal. Therefore, employ overtime labor to make a move on schedule, if you must, but a better way is to arrange to have equipment moves made on third shift.

This may be one way of getting more productive value out of the ser-

vice shift. You have to pay the shift differential but you do avoid overtime.

THE SKILL YOU WANT— WHEN YOU WANT IT

Intelligent control of overtime brings other benefits. One of the most wonderful of these is better local labor relations. Where overtime labor is excessively employed, everybody wants to get on the "gravy train". This may result in demands for equalizing the overtime among all employees. Carried to its extreme, this could come to the point where you would have to assign a pumprunner to the job of paralleling a pair of substations.

However, if the work at your mine is carefully planned and kept on schedule you will find that when overtime work becomes necessary you can pick the man best qualified to do the work at least cost. This will be worth a lot to you.

Mirror on the Boss

SUPPOSE YOUR EMPLOYEES were asked to list the three most satisfactory and the three most unsatisfactory aspects of their jobs. It is a pretty sure bet that they would list you—their supervisor—on one side of the ledger or the other. This interesting observation appears in a recent issue of Management Information, a weekly bulletin published by Elliott Service Co., to drive home the point that supervisors periodically should look at themselves as their employees might. The bulletin provides a list of YES or NO questions you might try on yourself. Here they are:

1. Listens carefully to what others have to say. Yes? No?
2. Never gives the feeling that he has

a "chip on his shoulder" when handling complaints and grievances. Yes? No?

3. Avoids forcing his own personal opinions on others. Yes? No?

4. Understands the problems of employees. Yes? No?

5. Avoids favoritism in applying policies and making assignments. Yes? No?

6. Makes employees feel that their jobs are important. Yes? No?

7. Is more concerned with what is right than who is right. Yes? No?

8. Recognizes the effects on employees of his own personal actions and statements. Yes? No?

9. Lets employees know where they stand and how they are making out. Yes? No?

Don't Get Excited

LATER THIS MONTH the miners will have their holiday, a prospect to be looked to with pleasure. However, it has been noted that approaching holidays sometimes lead to a relaxed attitude toward safety. This is as true of the miners vacation as it is of Christmas. Watch for signs of preoccupation among the men. Don't permit them to take chances. Even if you have to be hard about it you will be justified—you may be insuring a happy vacation for them.

Your vacation is approaching, too. Keep your mind off the trout until you get to the lake. And

when you get to the lake be sure you have your sense of safety with you. Boats can be dangerous. The sun can burn your lily-white skin to a crisp. Campfires can get out of hand. Children have a knack for getting lost or hurt in strange surroundings.

Don't let your feelings of gay abandon increase the weight of your foot on the accelerator. It's a shame to say so, but thousands of happy vacationers will be killed on our highways this summer.

We're not trying to spoil your fun, but please be careful. We need our readers, every one.

There's
MORE

from Allis-Chalmers...

Dependable POWER

for Ore and Rock Processing

Apply the many cost-saving features of Allis-Chalmers deep rib motor in a variety of processes... both indoors and out.

Here's why these motors offer more dependability in quarrying and mining operations:

MORE Cooling Surface — Rib-type design provides reserve cooling capacity — an important factor in dirty locations.

MORE Iron — Cast-iron frame and ex-

ternal parts assure greater rigidity and resistance to corrosion.

MORE Copper — Greater use of copper increases electrical life.

MORE Lubrication Provisions — Large grease reservoirs surround bearings. Provision made for in-service lubrication — important where moisture or corrosive vapors contaminate grease.

Rib-Type MOTORS 1 to 100 hp

Allis-Chalmers offers rib construction in all enclosed motors from 1 to 100 hp (through frame 505). To find out more about A-C motors, contact your nearby A-C distributor or district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS



A-5271

THESE KENNAMETAL REPRESENTATIVES HAVE 555 YEARS OF MINING EXPERIENCE

... and each is a specialist in real service
in the application and utilization of Carbide Mining Tools

37 years



EDWIN H. JOHNSON
Division Manager

15 years



EDWARD J. CARROLL
Assistant Sales Manager

51 years



ROBERT J. MCGINNIS
Supervisor, Latrobe, Pa.

26 years



CHARLES P. ADAMS
Vincennes, Ind.

14 years



JACK W. BEGLEY
Bluefield, W. Va.

38 years



MAX J. CAYLOR
Mars, Pa.

21 years



DALE CHRISTOPHER
Morgantown, W. Va.

24 years



MIKE K. COOKE
Wilkes-Barre, Pa.

22 years



STEWART EDWARDS
Waynesburg, Pa.

25 years



ABE L. GRAY
Blairsville, Pa.

16 years



BIRCHELL R. HELTON
Barbourville, Ky.

40 years



DARIO S. PARISI
Cadogan, Pa.

21 years



ARNOLD RIGGS
Crooksville, Ohio

24 years



ORVAL ROBSON
Supervisor, Waynesburg, Pa.

43 years



ROBERT T. SMITH
Glenshaw, Pa.

20 years



BENEDICT TEANO
Oak Hill, W. Va.

23 years



DOUGLAS L. TUNSBURG
Chattanooga, Tenn.

25 years



STANLEY TUROSSKI
Supervisor, Bedford, Pa.

25 years



DICK W. WELCH
Rimersburg, Pa.

21 years



J. VAUGHN WILCOX
Supervisor, Springville, Utah

24 years



JOHN D. WINGARD
Benton, Ill.

Kennametal Representatives offer more than just a product . . . they offer a *service*, too. Each man has served long years in the mines, has a sound, first-hand knowledge of every phase of operation. Each will go underground to appraise any individual problem, and then recommend the proper tool and proper drilling and cutting procedures to take care of the situation.

Each will, upon request, instruct machine operators in how to get the best from the tools, and, if desired, will conduct and supervise tests to evaluate performance in actual operation. Finally, any man

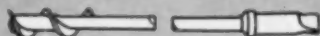
will, if asked, instruct mine maintenance men in the proper methods of regrinding and reconditioning Kennametal Tools.

Feel free to call for this help at any time . . . it is always at your service!

C-3028

INDUSTRY AND
KENNAMETAL
... Partners in Progress

AVAILABLE . . . a complete line of Kennametal
Cutter Bits, Drill Bits, Roof Bits,
Pinning Rods, Augers and Accessories



Style PR Pinning Rod



Style PRF Pinning Rod



Snap-Button Shank Auger



Threaded Auger



Hex Snap-Button
Shank Auger



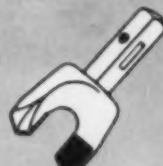
Style BR Drive Socket



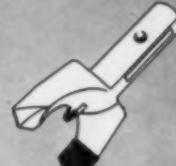
Style U-B



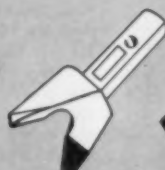
Style U9R



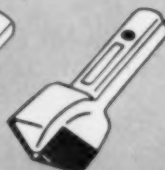
Style D



Style DC



Style DL



Style FDH



Style FDL



Style PA

OPERATING IDEAS



Jointed Auger Eases Roof Drilling

EASIER and faster roof drilling is possible with this hinged auger developed at Duquesne Light's Harwick mine for use with bolting machines mounted on continuous miners. The jointed auger section simplifies the job of placing a longer auger section into a started hole when 5- or 6-ft bolts are used. Note in the photo how much longer the hinged auger is than the distance between the drill chuck and the roof.

The hole is started with a regular short section of drill auger and finished with the longer jointed section. Depth of this portion of the hole is greater than the distance from the bit to the joint of hinged unit. Thus when the longer auger section is placed in the hole the joint is up in the hole and there is no whipping of the auger as the hole is deepened.



Rack Keeps Drill Bits Close to Roof Driller

TO KEEP drill bits close to roof drillers and at the same time prevent loss or damage to bits, the Duquesne Light Co. added this convenient holder to continuous miners. Roof bolting drills are mounted on the continuous miners at the company's Harwick mine. This handy rack keeps a sharp bit always at the driller's finger tips and a dull one can be swapped out in a minimum of time. The dull bits are placed in the small bit carrier shown standing on top of the bit rack. At the end of the shift each driller takes the dull bits to the surface where they are resharpened.

Each driller receives the same number of sharp bits in his holder at the beginning of the next day as he brought out the previous day. The company reports that since the racks and individual holders have been put in use fewer bits are lost.



Indicator Shows Width of Place

HERE'S a simple device that helps continuous miner operators judge the width of the working place at Duquesne Light's Harwick mine. The ends of the semi-circular bar, made from 4/0 trolley wire, fit into posts welded onto the frames of the cutting head motors of Joy ripper-type miners. A series of notches on the bar permit the operator to observe the width he is making. The curve distance between notches on the bar represents 30 in of width at the face and corresponds to the width of the ripper head of the machine. As the ripper head is moved across the face the operator watches the swing of the notched bar. There are enough notches on the bar to measure a place 15 ft wide.



USKORONA SPLICING TAPE

ABOVE...

When you have to make an emergency splice, pick Uskorona.® It's a tape that can handle a wide range of electrical and general purpose jobs. It exceeds A.S.T.M. specifications. It has high dielectric and tensile strength, high elongation and low power factor. It fuses quickly without heat or pressure and makes splices that *last*. A cable becomes as good as new when you use Uskorona. And to complete the splice, U. S. Rubber Uscoprene splicing compound provides an outstanding weather and oil resistant jacket.

A complete line of electrical tape is obtainable at selected distributors or one of our 28 District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

In Canada, Dominion Rubber Company, Ltd.

or BELOW!



Uskorona Splicing Tape and Uscoprene Splicing Compound restore the original dielectrical and mechanical qualities of the cable.



Mechanical Goods Division

United States Rubber



Loader places heavy timbers on car . . .



Locomotive pushes full car to shaft . . .

Special Material Car Eases Timber Handling



Hoist pulls car to track . . .



Lifts the load of timbers . . .



Lowens it on to supply car.

HOW can long, heavy crossbars be lowered into a shaft mine with the least effort? Duquesne Light Co. has found an answer to this question at its Harwick mine. Using ideas borrowed from other mining companies and the ideas of the men who handle supplies at Harwick, the company has designed a special material car to lower 20 heavy 5x7-in by 14-ft crossbars at a time and with a minimum of human effort. From the time timbers are taken from the supply yard to the time they are used underground the greatest effort required is straightening the pile as crossbars are placed on the special car. By using the mechanized methods to handle the heavy crossbars, the company saves an average of two manshifts per day. Two men on the day shift are able to load and lower all of the supplies for all three shifts.

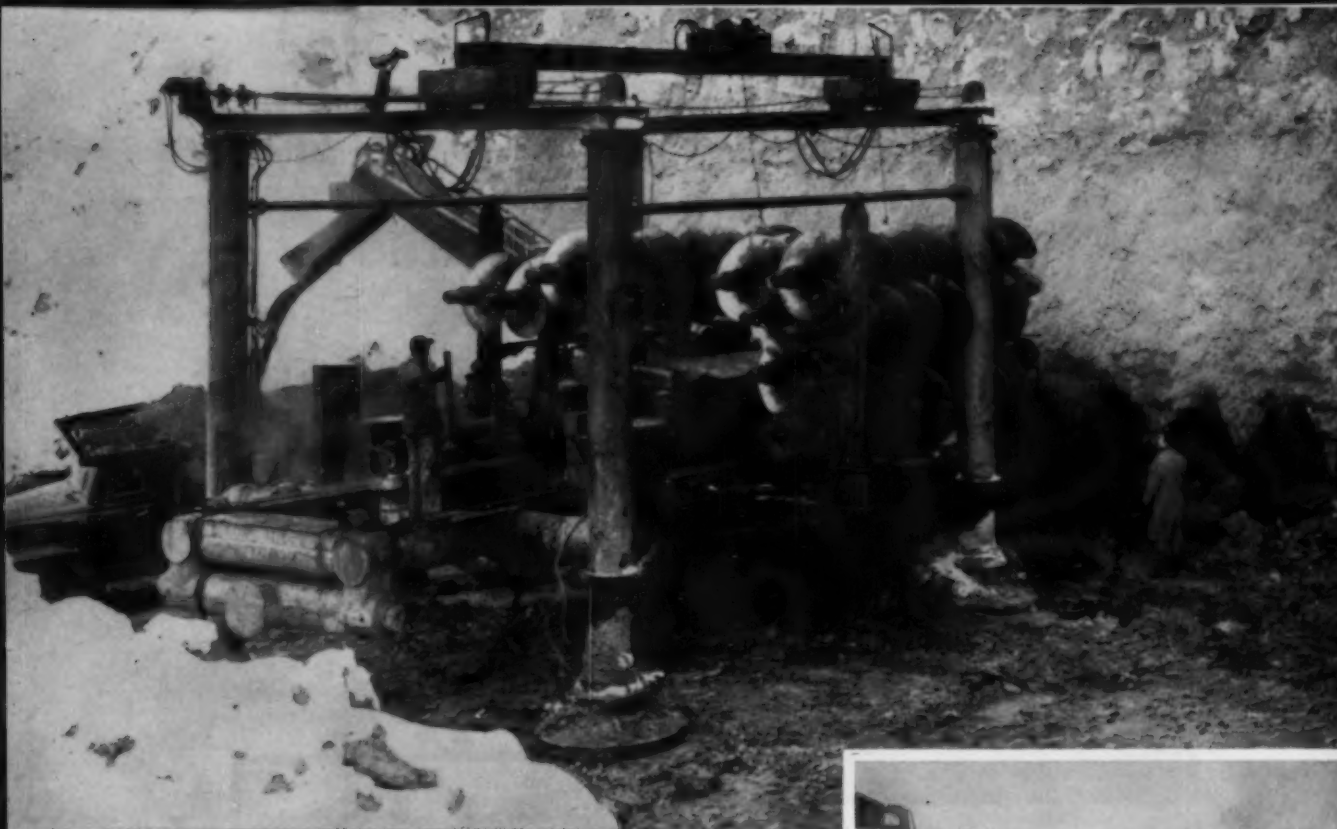
Crossbars, roof bolts and other supplies

are delivered to the mine and stockpiled in assigned areas along the supply track. One man operates a Drott skid-loader to pick up the heavy timbers and place them on the special material car. The second supply man straightens the crossbars while the loader returns to the pile for another load. After 20 bars are stacked in the car they are secured in place by two chains and pushed to the shaft by a small Brookville gasoline locomotive.

A special sling device attached to one end of the supply car permits it to be swung vertically from two ship channels attached to the bottom of the 8x11½-ft supply cage. As the car is pushed under the cage, the sling slides into offsets in the channels and is locked in position. Next the cage is raised and the supply car lifted to vertical position and centered over the shaft.

When the car reaches the foot of the shaft, the footman attaches a chain hoist to a loop in a section of wire rope which is attached permanently to the lower end of the car. He then uses the hoist to swing the end of the car outward to the supply track. When two pony wheels at the lower part of the car touch the rail, the cage is slowly lowered until the car reaches a horizontal position. It then is pulled forward until the crossbars clear the shaft.

The chains securing the crossbars to the car are loosened and another chain placed around the timbers so they can be lifted into the air, then the car is pulled back into the shaft. As soon as the special car clears, the timbers are lowered onto an underground timber car for delivery to the section. The special car is then hoisted to the surface and reloaded.



Brutal coal-boring service calls for auger blades of USS COR-TEN Steel

CRUNCHING through wet, abrasive coal and rock in sub-zero temperatures is the kind of murderous service that takes the bite out of boring equipment—but fast! In this case, however, TASA Coal Company of Pittsburgh, Pa., reduced auger wear and corrosion to a minimum, by fabricating replacement blades from $\frac{5}{16}$ -inch COR-TEN Steel.

Each section of auger is 17 feet long. The blades, or flights, are 42 inches in diameter. As each section chews into the coal vein to its full length, the chuck is opened and another section is added on. This particular coal seam near Clarksburg, W. Va., was penetrated to a depth of 200 feet.

These blades of USS COR-TEN Steel are the logical answer to the constant destructive forces of abrasion and corrosion. COR-TEN has, in addition to its high strength (50,000 psi. min. yield point) and abrasion resistance, 4 to 6 times greater resistance to atmospheric corrosion than carbon steel.

All three USS High Strength Steels—COR-TEN, MAN-TEN, and TRI-TEN "E"—enable mining equipment to give far more service per dollar of cost than structural carbon steel. They possess a 50% higher yield point, and, in varying degrees, offer greater resistance to wear, fatigue, abrasion and impact. These USS High Strength Steels are used

to replace carbon steel in the vital parts of mine cars, dozers, shovels, drag lines and other such equipment to increase service life without increasing dead weight. Where the use of thinner sections is feasible, they can frequently (1) reduce equipment weight without reducing its strength, or (2) increase the size and capacity of equipment without increasing the total weight or the power needed to move it.

Want further details? Write to United States Steel, Room 2801, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

Remember that we also produce USS "T-1" Steel, a construction alloy steel ideally suited for mining and materials handling equipment. Write for our booklet, "T-1."

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS HIGH STRENGTH STEELS

MAN-TEN • COR-TEN • TRI-TEN "E"

USS, MAN-TEN, COR-TEN, TRI-TEN "E" and "T-1" are registered trademarks.



UNITED STATES STEEL

Semi-Automatic

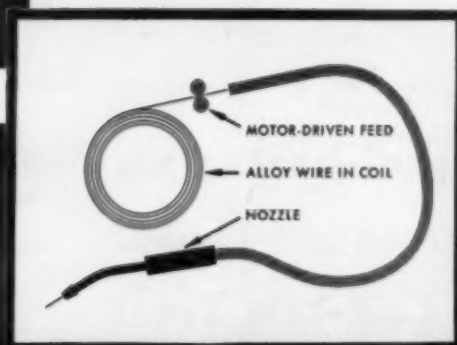
with STOODY WIRES

**Takes the work out of welding —
speeds application — cuts overall costs!**



How Stody Semi-Automatic Hard-Facing Works

Stody Wires are supplied in layer-wound coils for use on any automatic welding machine, with minor conversions. The wire is mechanically fed to the nozzle by a motor-driven feed roll and idler roll which are actuated when the arc is struck. The welder thereafter merely directs location of the weld deposit, the machine feeding the wire automatically as the arc is struck, stopping when the arc is broken.



Hard-Facing

Semi-automatic hard-facing with Stoodly Tubular Alloy Wires is one of the greatest labor-saving processes yet developed for the maintenance man! It hustles you through jobs at speeds 2 to 4 times faster than manual welding. Wires are bare, need no flux or flux dams. Deposits are thus fully visible during welding...easy to lay along an edge or to a mark.

With Stoodly Wires you get *low penetration*, this means less dilution and, consequently, a higher alloy content in the final deposit. Wear resistance is thus improved...usually superior to manual electrodes of similar analysis.

Finish on the wire is clean and bright, free from burrs and slivers, insuring smooth feed through the machine. Because the wires are drawn through special sizing dies after being formed they are concentric, true to diameter and uniform throughout their length. Special chemically coated papers protect against rusting and the fibreboard shipping container insures all shipments arriving undamaged, ready for use.

When you load your first coil of Stoodly Wire you'll find the nylon wrapping especially handy—no heavy wires or straps to remove, yet the wire stays coiled till you're ready to weld!

Remember, with Stoodly you get a complete range of proven, time-tested wires, from low alloy to high alloy types, plus a tungsten carbide...all backed by 10 years use in the field!

Nickel Manganese and Stoodly 121 Wires are available in $\frac{3}{32}$ " or $\frac{1}{4}$ " O.D. Other alloys in $\frac{3}{4}$ " diameter only. All Stoodly Wires feed through most semi-automatic machines with only minor changes in wire guides, feed rolls and nozzle.

For more information see your nearest Stoodly dealer, 600 of them, in all parts of the U.S. and Canada (check the Yellow Pages of your phone book) or write direct.

STOODLY COMPANY

11943 East Slauson Avenue
Whittier, California

Stoodly 100

Applications... Crusher rolls, impellers in impact type crushers, bucket teeth and lips, scarifiers and rippers, tool joints, cement mill pulverizer rings and loader lips

Stoodly 100HC

Applications... Catalyst piping, Banbury mixers, crushers and parts subject to severe abrasion

Stoodly 102 (for submerged arc application only)

Applications... Cable sheaves, small diameter shafting, shovel idlers and equipment subject to high compressive loads

Stoodly 104

Applications... Designed primarily for build-up of carbon and low alloy steels

Stoodly 107 (for submerged arc application only)

Applications... Crane wheels, house rollers, mine car wheels, tractor and shovel parts subjected to severe impact

Stoodly 108

Applications... Sprockets, shovel idlers and pads

Stoodly 121

Applications... Crusher rolls, impellers in impact type crushers, bucket teeth and lips, scarifiers and rippers, cement mill pulverizer rings, loader lips

Stoodly 130

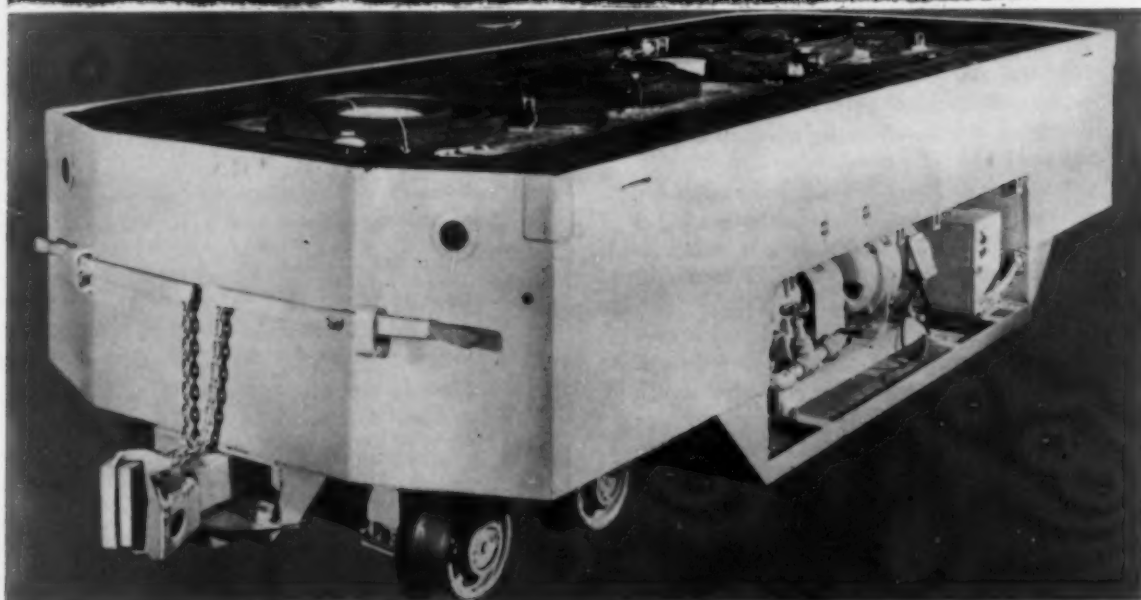
Applications... Earth boring and scraping operations on equipment such as tool joints, augers, conveyor flights, scraper blades, rippers and concrete mixer paddles

Stoodly Nickel Manganese

Applications... Strength welding and rebuilding of manganese parts



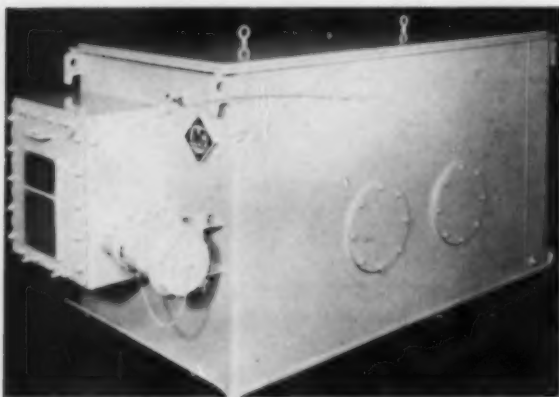
EQUIPMENT NEWS



Underground Fire Truck Delivers 100-Gpm Water Stream

Mine Safety Appliances Co. is producing a mobile mine fire truck which is designed to combat the most stubborn underground fire, according to the company. The truck, designated Model 2100, has a capacity of 2,100 gal of water in standard design. A 20-hp, 3,500-rpm electric motor is directly coupled to a two-stage centrifugal pump that will deliver 100 gpm with a 450-ft head. The unit is capable, says MSA, of throwing a horizontal stream a distance of 100 ft. The truck itself, which the company says is capable of negotiating a No. 2 turnout easily, is equipped with

standard, eight roller bearing wheels designed with 5-in tread. An all-steel unit, the truck's plate intersections are triple-welded at the joints. Its fire hose is impervious to oil, acid, rot, and vermin. The 2100, or standard unit, is 18 ft long, 7 ft wide, and 50 in high. Its interior finish is bituminoid coating and baffle plates prevent water surging while the truck is in motion. A special hose nozzle will deliver either a heavy fog or an extremely concentrated stream, says MSA, which recommends leaving the unit underground at all times.



A-C Offers Underground Transformer

A fire and explosion-proof sealed dry-type transformer in the 5-kv class and below is being manufactured for underground service by the Allis-Chalmers Pittsburgh Works. The

transformer is designed with heavy plate construction and can be dragged to a working area. The company reports that the unit can be placed safely in flood areas, dirty or contaminated atmospheres, and in open work spaces without erecting vaults or barriers. In addition, the company reports the transformer is designed to require a minimum of maintenance. The unit above is a 225-kva, three-phase, 60-cycle, 150 C rise, air-cooled, sealed, dry type.

New Caterpillar Earth-Moving Team

Caterpillar Tractor Co., Peoria, Ill., is manufacturing a new four-wheel prime mover and a matching scraper combination. The prime mover is the DW15 (Series E) tractor, the scraper is the No. 428 "Lowbowl." A new diesel developing 200 hp at 2,000 rpm has been installed in the DW15. Its design takes advantage of natural engine lug characteristics to accomplish a 23% torque rise and high rim pull over a wide speed range, thus decreasing the need for changing gears. In fourth gear, for example, more than 3,000 lb of rim pull are delivered when the tractor is operating between speeds of 9 to 18 mph. In addition, the DW15 (Series E) uses a ten-speed transmission, which provides working speeds

Gets the best of **BAD SEAMS...**




CP Hydraulic Coal Drill

Drilling a 9 foot hole every 30 seconds in bad seams is standard for this 35 lb. coal drill. Long auger lengths are easy to handle. Its high torque motor packs the power for hard drilling . . . responds instantly. 1000 RPM auger speed holds vibration to a minimum.

Run the CP-35-HCD from the power system of cutting, timbering or roof bolting machines. Absolutely safe . . . no sparks or shock . . . no kick on stall! For details, write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

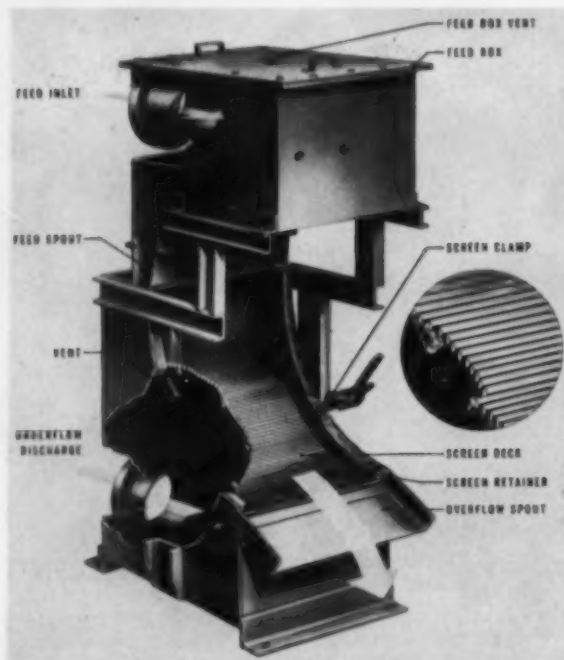
ACCESSORIES INCLUDE: Valves, gauges, junction blocks, hoses and fittings


Chicago Pneumatic 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



from 2.7 to 37.2 mph. The new No. 428 scraper's "Low-bowl" design is similar to that used on larger scrapers. The scraper's struck capacity is 13 cu yd (an increase of 4.1 yd over its predecessor, the No. 15); its heaped capacity 18 cu yd. Additional designs: increased ground clearance and an increased apron lift height.

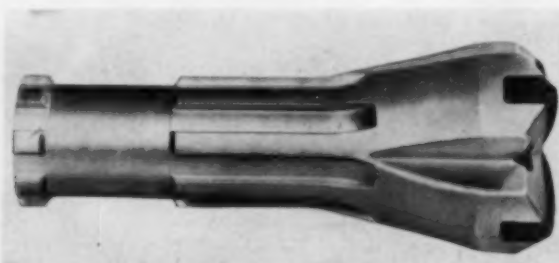


High Capacity, Stationary Screen

Dorr-Oliver, Inc., Stamford, Conn., has introduced the Dorr-Oliver DSM screen for continuous wet screening of slurries containing non-fibrous solids. The new screen, a stationary unit, is said to be particularly adaptable to separations in the 8 to 48 mesh range. Because of what the company calls "unique principles of design" both screen capacity and efficiency are reportedly far greater than those of vibrating screens. The new screen is basically a concave, horizontal-wedge-bar type, which is secured in a stationary housing. An integral part of the housing is a feed box equipped with both an inlet port and a feed spout. The feed spout distributes incoming slurry across the full width of the screen in such a way that the feed strikes the curved surface tangentially. Undersized material, which passes through, is collected in the lower part of the housing and is discharged through another port. The oversized product flows across a lip at the base of the screen. Particle size separation is controlled primarily by the width of the openings between stainless steel wedge bars. The distance between each bar is approximately twice the diameter of the largest particle desired in the screen undersize. As incoming slurry flows across the concave arc, a layer of slurry containing undersized material is deflected downward by the bar. The remainder of the slurry passes across the face of the bar. As this stream strikes the edges of succeeding bars, additional

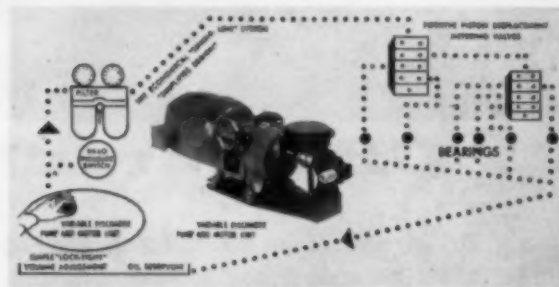
layers are sliced off until only oversized solids remain in the slurry. These larger particles do not pass through the bar openings, but are deflected upward to follow the curvature of the screen to the discharge lip.

The new screen's design is based on designs by the Dutch States Mines in the Netherlands and has had wide application in the coal industry abroad. Since 1954 Dorr-Oliver has been developing the screen's design and commercial application possibilities under patent rights acquired from the Dutch State Mines. The company says today that the major advantage of the DSM screen is high capacity and ability to handle flow volumes far greater than other types of screens. Its design features are said to prevent blinding, and installation and operating costs are reportedly low, since no power is required to operate the screen and a minimum of service is required by the stationary parts. Made in four standard height sizes but in widths from 1 to 4 ft, the DSM screen has a capacity of some 200 gal per ft of width per min when making a 48 mesh separation, 500 gal per ft per min in producing an 8 mesh separation. In all units the screen can be reversed to maintain uniform wear across its face.



Spline-Bodied Percussion Bit

Both the 6- and the 6½-in Brunner & Lay "Hole-Master" bits, which are designed for use with "down-the-hole" type drills, have been added to the line of percussion rock drill bits manufactured by Chicago Brunner & Lay Bit Corp., 9200 King St., Franklin Park, Ill. The bits are designed with a splined steel body and contain fast-drilling carbide inserts that reportedly have unusual resistance to wear and shock.



Trabon Oil System Reported Improved

Trabon Engineering Corp., 28757 Aurora Rd., Solon, Ohio, is marketing a new "Meterflo" circulating oil system. The system, which proportions oil to any number of bearings on a machine, is reportedly an improved one. Named the "Mark II" by Trabon, the new "Meterflo" includes a variable discharge pump and motor unit. An adjustable volume control is available to meet various machine designs and oil viscosity requirements. Reportedly, positive discharge at any setting is assured regardless of the required system pressure. Another advantage pointed out by the manufacturer is a "hi-lo" pressure switch, which is part of the pumping unit, and which can be set for wide normal operating range. In addition, the inability of any bearing or line to receive oil will activate an alarm signal blinker light.



132 PIECES TO LUBRICATE...

11 Cities Service Lubricants do job!

Located at the eastern end of the great Mesabi Range, the beneficiation plant of the W. S. Moore Company is made up of 132 individual pieces of equipment.

In itself, that makes a formidable lubrication job... but added to that is the fact that much of this equipment must constantly be exposed to the weather.

Corrosion, oxidation and rust could reap costly damage... but instead they're licked!

How? Through the use of a detailed lubrication survey and frequency application chart prepared with the assistance and cooperation of Cities Service Lubrication Engineer James Levine!

Result: all 132 pieces of Moore's equipment are lubricated by eleven Cities Service Lubricants... and there's never been a lubrication failure!

Perhaps a Cities Service Lubrication Engineer can help simplify and improve your lubrication picture, too. It costs nothing but a telephone call to your nearest Cities Service office to bring him over. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

WHAT THE CITIES SERVICE LUBRICATION ENGINEER RECOMMENDED

EQUIPMENT	LUBRICANT
Gear reduction sets	Pacemaker #3 and #5
Screen and feeders' gear boxes	Trojan L-2 and L-4 compounds
Electric motors, conveyor bearings	Trojan H-1 and H-2 grease
Compressors	DC 915 compressor oil
Jaw and gyratory crushers	Trojan MP 90 and 140 gear oil
Open gears	Cisco 32
Jaw crusher	Trojan F-3-0

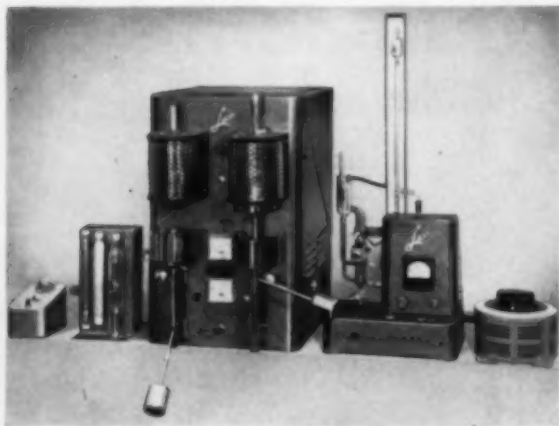
CITIES  SERVICE

QUALITY PETROLEUM PRODUCTS



Conveyor Belt Repairing

Automatic Vulcanizers Corp., 16 Hudson St., New York 13, N. Y., is marketing a line of cold self-vulcanizing conveyor belt repair materials named "Pang." The material cures without heat or pressure. Contained in the kit are 96 patches of various sizes, 1 lb of cold self-vulcanizing cushion rubber, and 2 lb of tread rubber. The kit's rubber compounds, upon mixing at room temperature, form a tough resilient rubber. With the aid of a heat lamp formation occurs in 1 hr. Repairs made with the patches, says the manufacturer, can be put into service immediately. The kit also contains a set of expendable tools and 525 sq in of cold self-vulcanizing conveyor belt surface plate $\frac{1}{16}$ -in thick. All repairs are said to be impervious to heat. Heat, in fact, is reportedly an aid to bonding since it further welds old stock with the new material.



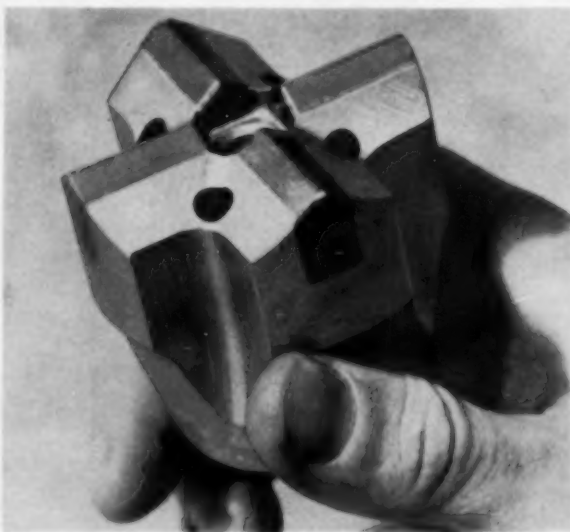
Ash, Sulfur Analysis In Minutes

A new high temperature method to determine in minutes the ash and sulfur content in coal and coke is being offered by the Laboratory Equipment Corp., St. Joseph, Mich. The method, traded as "Leco," requires only 10 or 15 minutes for coal ashing, according to the maker, who points out that other methods require 1 to 2 hr for this phase of the operation. The coal is pyrolyzed in a high-temperature furnace in a stream of nitrogen to remove the volatiles. This is followed by oxidation in a stream of oxygen. Sulfur analysis, says the company, requires only 6 min. Coal is burned at a temperature in excess of 3,000 deg. The sulfur that is released as sulfur dioxide is titrated automatically with a sulfur titrator.

Power Take-Off For Engines To 600 Hp

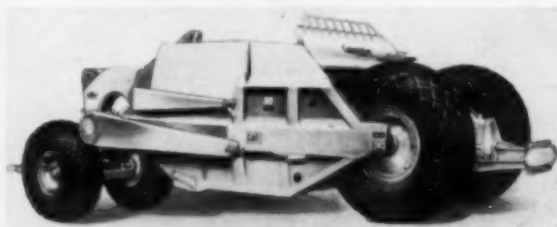
A remotely controlled friction power take-off for use with engines up to 600 hp has been announced by the Twin

Disc Clutch Co., Racine, Wis. Air-operated, the unit is a cross between the Twin Disc Model PO air clutch and the company's standard friction power take-off. Engagement and disengagement are accomplished by turning an air valve, rather than by manually operating a handle. In addition, the company's engineers have added a rotary seal to the end of the unit's output shaft to permit actuating air to enter the clutch through a drilled passage in its shaft. Air pressure from 90 to 100 psi produces all the torque needed, says Twin Disc, but 130 psi can be utilized.



16 Bits Comprise New Atlas-Copco Line

A new line of Sandvik Coromant detachable bits equipped with tungsten carbide inserts is being marketed by Atlas Copco Eastern, Inc., Paterson, N. J. Sixteen bits comprise the new line, which is recommended for all rock drilling needs. Diameters range from $1\frac{1}{2}$ in to $4\frac{1}{2}$ in. Larger inserts are said by the company to insure high footage and extremely low cost per foot drilled. The line has been designated the "776," and is for use on standard shoulder type drill rods with F, H, D, and K threads.



Scraper's Capacity Is 82,000 Lb

Caterpillar Tractor Co., Peoria, Ill., is making a new large-capacity scraper designed for use with the Caterpillar D8 and D9 tractors. The scraper, designated the No. 491, replaces the No. 90. Its payload capacity of 82,000 lb is 12,000 lb greater than the No. 90. Struck capacity is 27 cu yds, heaped capacity 34 cu yds. Another feature is an increased apron opening, which provides 15 in more opening than the No. 90. This, combined with higher bowl sides and height changes, is said to permit easier handling of large loads. Tires are tubeless.

Other features include: three-piece cutting edge with stinger-bit center section; good visibility to the cutting edge from the operator's seat; low maintenance costs; and high maneuverability.

Free-riding, all-rubber fillers
for moisture resistance,
splicing and terminating ease
unusual flexibility

Special, helically-wound semi-
conducting tape around each extra-
flexible, stranded conductor,
to prevent ionization

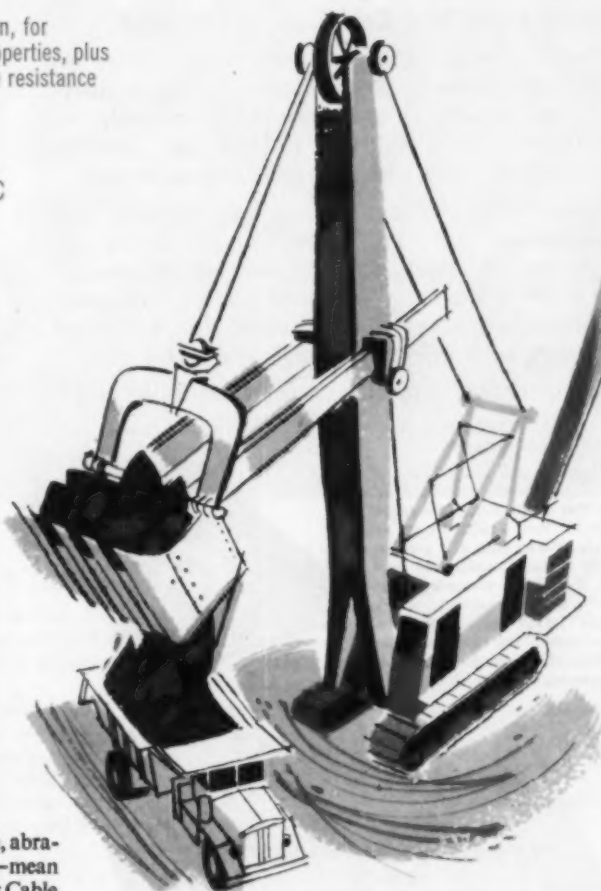
Butyl conductor insulation, for
outstanding electrical properties, plus
heat, moisture and ozone resistance

A combination of properties
which permits operation with
copper temperatures up to 85°C

IT'S THE EXTRAS THAT MAKE THE DIFFERENCE IN ROEBLING SH-D PORTABLE POWER CABLE!

These *extra* features and others—such as the tough, abrasion- and weather-resistant Roeprene® Sheath—mean rugged, full-power Roebbling SH-D Portable Power Cable really can stand the gaff.

If you saw this cable made, you'd know why it is so tough...and if you saw it made, you'd never specify anything else! For complete information, write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.



ROEBLING

Distributors, Branches and Warehouses in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation





Here it is!
the new **CONCENCO® "77"**
DIAGONAL-DECK®
Coal Washing Table

This is the new twin deck CONCENCO "77" DIAGONAL-DECK Coal Washing Table introduced at the May Coal Show in Cleveland.

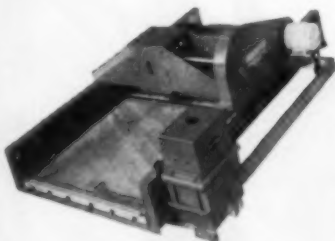
Two identical decks, operating from a single integrally connected head motion, . . . all in floating suspension . . . coordinate completely for uniform high efficiency. Doubling of capacity in the necessary unit of floor space is obvious.

Adjustments for controlling side tilt and end inclination are simple, with both decks responding in unison. Cable suspension for smoothly floating the complete table assembly in space reduces impact to the building for first cost savings with lighter housing structures.

For complete information send for Bulletin 77.

**FOR SCREENING
ECONOMY**

All New Model Leahy® screens utilize proven differential vibration that snaps oversize wedging particles loose 1600 times per minute. When dust is a problem, totally enclosed models are available. For damp screening, Flex-Elex® electric heating of the screen jacket insures full-time open mesh. For wet screening CONCENCO spray nozzle arrangements are available.



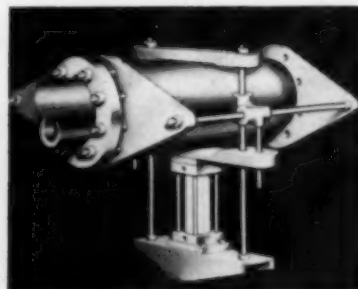
**THE DEISTER ★
CONCENTRATOR
COMPANY**

723 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

**CONCENCO
PRODUCTS**

★ The ORIGINAL Deister Company • Inc. 1906

Equipment News (Continued)



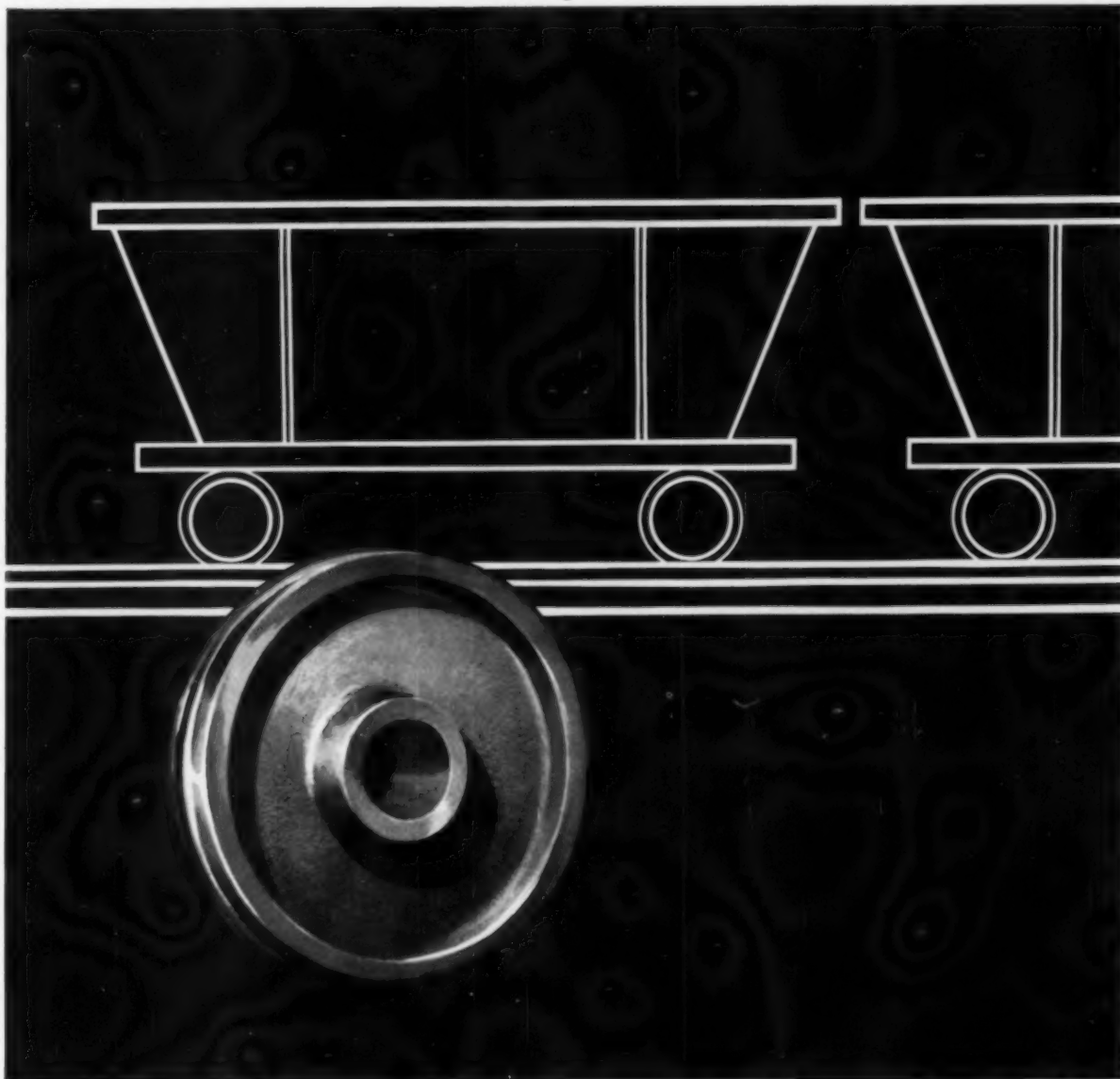
Pinch Valve Improved

New models of the Massco-Grigsby pinch valve are said to contain several improvements, according to the manufacturer, Mine & Smelter Supply Co., 3800 Race St., Denver, Colo. As a handler of abrasive and corrosive materials, the valve is made in sizes from 1 in to 14 in inside diameter, and for pressures to 150 psi, temperatures to 200 deg. It is available with rubber or neoprene sleeves. An outstanding feature, says Mine & Smelter, is the "Hydral-Air" operating mechanism (not in photo) for closing. It consists of an air-hydraulic pump and can be installed as a centralized unit for operating several valves. It also can be equipped for automatic regulation where it is essential to control liquid level in tanks or rate of flow in pipe lines. Other new operating mechanisms include a torque arm reducer for manual operation and a motorized unit. Remote control is possible on all types when the valve must be situated in inaccessible places. Another feature of the valve is a molded recess design in the sleeve interior, which serve as hinges during compression. Further, the sleeve is belled on both ends and designed to fit between split flanges and standard pipe flanges. This sleeve arrangement, says the maker, forms a perfect seal, eliminates packing glands, and provides a straight flow. For specifications and additional information the Mine & Smelter Supply Co. is distributing a 10-p folder titled "Pinch Valves."



Fastener Sealant

The American Sealants Co., Trinity College, Box 260, Hartford 6, Conn., is marketing a sealant for threaded



easy dispensability, long lubrication

Nakta was developed by years of Esso research to meet the exacting requirements of mine car wheel lubrication. Its excellent lubricating properties have been *proved* in millions of miles of actual service.

Nakta has four characteristics essential to the best mine car wheel lubrication: *easy dispensability, extra strong adhesion, excellent moisture resistance, good structural stability.*

With its medium viscosity base oil, Nakta has better low-temperature dispensing properties than most similar type greases (yet it's also excellent for warm weather use!). It

adheres strongly to metal surfaces . . . sharply reduces grease loss through leakage, permits much *longer* periods between lubrications. Because of its good structural stability, Nakta is perfect for central lubrication systems.

Nakta is available in *six* consistency grades . . . plus a harder grade with graphite (Van Nakta 2). Find out more about Nakta from your nearest Esso Standard Oil Co. Division Office: Boston; Pelham, N. Y.; Elizabeth, N. J.; Bala-Cynwyd, Pa.; Baltimore; Richmond; Charlotte; Columbia, S. C.; Memphis; New Orleans.

NAKTA

Reg. U. S. Pat. Off.

FOR BETTER RESULTS



PETROLEUM PRODUCTS

Equipment News (Continued)

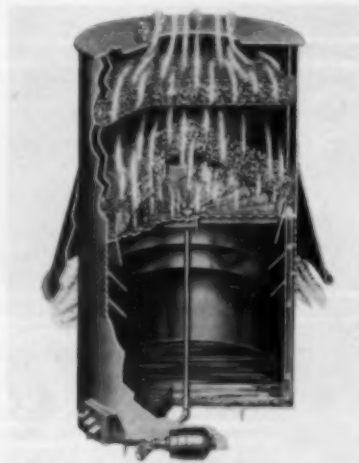
fasteners, which the company says will set screws so securely that no amount of vibration will shake them loose. Yet the screws can be removed with ordinary tools. The company points out that nuts and bolts that fall out and are lost cost more in replacement trouble than their actual cost. The sealant, named "Loctite," is designed to head off this relatively major cost to repair or maintain a minor item.



Poison Ivy Ointment

Outdoor workers reportedly will get quick relief from poison plant irritation with the individual poison ivy ointment

packets introduced by the Medical Supply Co., Rockford, Ill. Traded as No. A-17, the ointment is applied by squeezing the foil packaging envelope after tearing off a corner. The company says the ointment is effective as either a preventative or a cure.



Oil Bath Air Cleaner

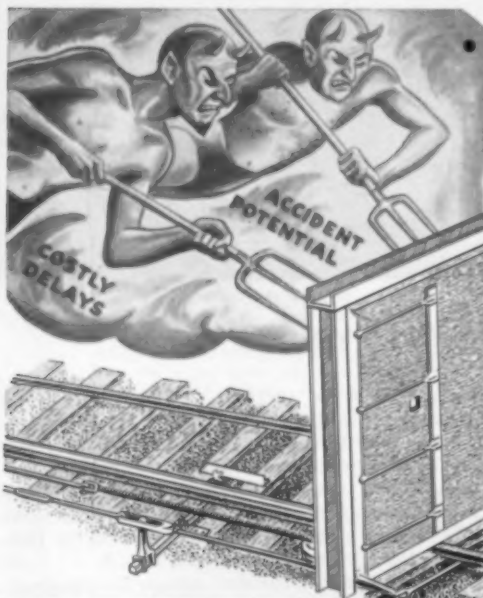
Four major improvements in oil bath air cleaning are claimed by American Air Filter Co. with the introduction of its "Cycoil" oil bath cleaner. The newest model, Type P low resistance-high efficiency cleaner, offers a redesigned base for less expensive installation; improved

protection at the air intake against snow and water; greater bug protection; and redesigned and improved valves. After oil and intake air are mixed the cleaner's filter pad drain is said to insure 100% removal of damaging dust. This, plus the company's perforated entrainment plate principle, are said to provide complete dust protection for supercharged engines and centrifugal compressors. Address: 215 Central Ave., Louisville 8, Ky.



Four-Wheel Drive Trucks

Chevrolet Motor Div., Detroit 2, Mich., is producing 12 models of four-wheel drive trucks. The trucks are expected to meet special demands of



...You thwart two devils

with the **AUTOMATIC AMERICAN MINE DOOR**

**ELIMINATE ACCIDENT POTENTIAL...
...CUT DOWN COSTS!**

Eliminate the possibility of those ever-dangerous inflammable gas pockets by installing dependable, positive-acting Mechanical American Mine Doors. They fly open . . . snap shut . . . trips travel through them at full speed. Two American Mechanical Doors properly positioned make perfect air lock. Can't be left open to cause disaster, require no man for opening or closing; increase tonnage taken out. Write:



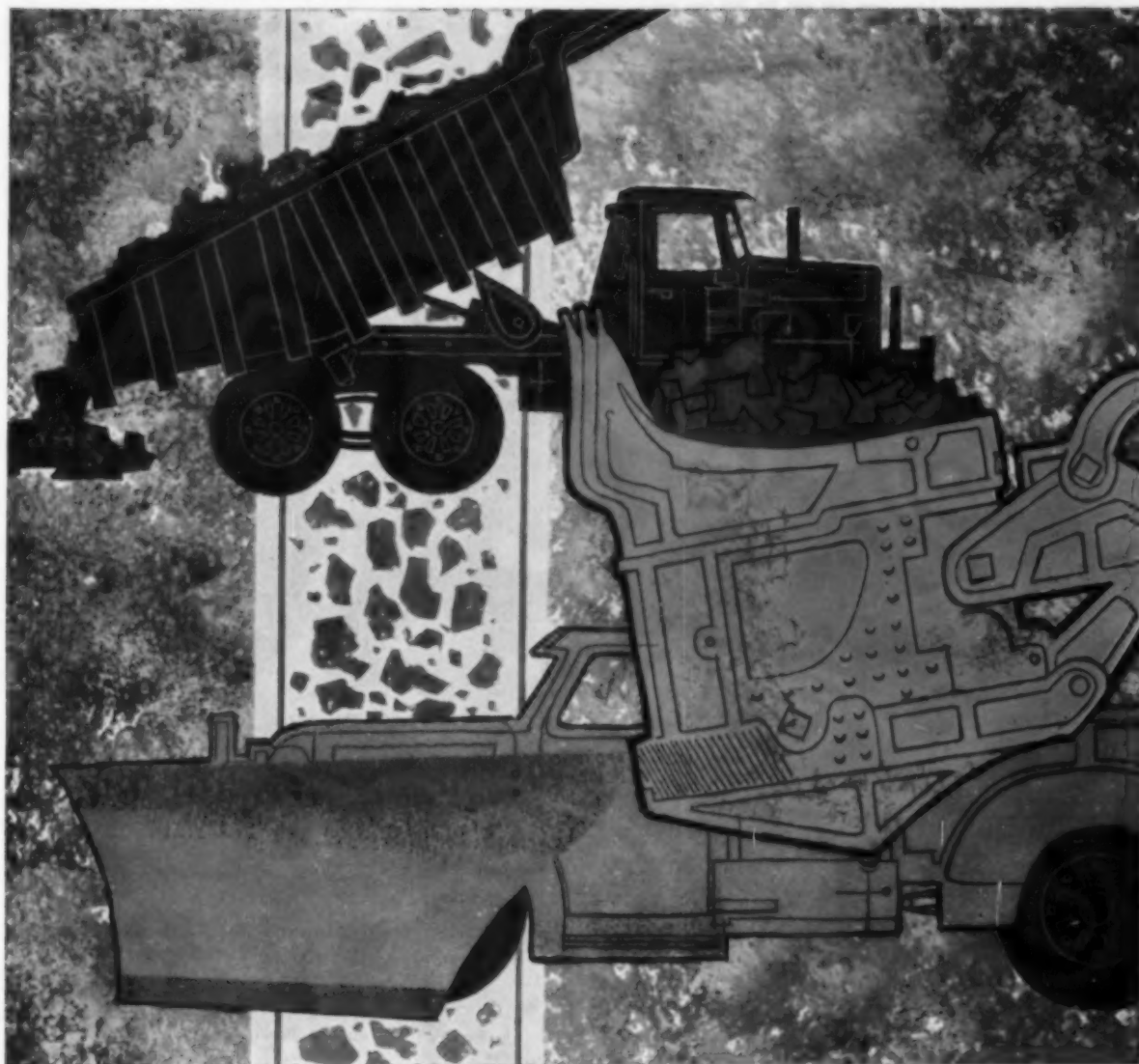
The American Mine Door Company

2057 Dueber Ave.,

Other self-liquidating equipment — Mechanical Track Cleaner . . . Electric or Air-operated Track Switch Throwers . . . Air or Manual-operated Car Transfers—Wet or Dry Rock Dusters . . . Cable Splicers . . . Cable Vulcanizers. Write for descriptive brochures.

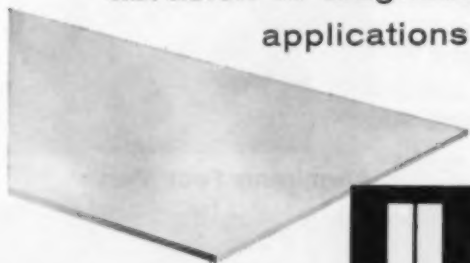
Canton 6, Ohio

The Automatic door mechanism that NEVER FORGETS—that NEVER DELAYS!



JALLOY special alloy steel

resists impact and
abrasion in toughest
applications



Heat treated Jalloys wear as much as 20 times longer than mild steels under rigorous impact and abrasive conditions. By using Jalloys you can cut maintenance costs drastically. Increased product life reduces downtime and lowers your labor costs.

Jalloys are available in the forms you require (plates, hot rolled sheets, hot rolled bars, small shapes and structurals). Jalloys can be purchased in three grades to meet specific use requirements: Grade 1, where formability is important; Grade 3, capable of being heat treated to excellent physical properties for good resistance to abrasion or wear; Grade 7, where high hardness with good ductility or wear resistance is desirable.

Your local distributor can supply you with latest information on these Jalloys grades, or you can write to Jones & Laughlin Steel Corporation, Dept. 411, 3 Gateway Center, Pittsburgh 30, Pa.

Jones & Laughlin
... a great name in steel

Continental

Self-Aligning BELT TRAINING IDLERS



... and
return



**Designed and built for
accurate and positive belt training
for ANY material ...
under ALL conditions.**

Incorporating tapered roller bearings with combination labyrinth and contact seals, for long and trouble-free operation under the most rugged conditions. Standard sizes stocked for immediate shipment.

*Call, wire or write your nearest
Continental Office*

CG-6718

**INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY**

BIRMINGHAM, ALABAMA



ATLANTA
MEMPHIS

CLEVELAND
MOBILE

DALLAS

KNOXVILLE
NEW YORK 17

Equipment News (Continued)

off-highway operations, and are available in $\frac{1}{2}$ -, $\frac{3}{4}$ -, and 1-ton pickup models; in a 1-ton panel; and in $\frac{3}{4}$ - and 1-ton stake models. Power is supplied through a four-speed transmission, then "split" between the front and rear wheels through a two-speed transfer case. Front-wheel drive can be disengaged at any time without using the clutch if the transfer case is shifted into direct drive.



Diamond Coring Bits

"Drilco," a new line of diamond coring bits made with various quality African diamonds is being manufactured by Diamond Products, Inc., 396 Prospect St., Elyria, Ohio. The bits are furnished in DCDMA standard sizes from EXT to 7 $\frac{1}{4}$ -in diameters. The diamonds are set in a choice of three types of powdered metal matrices: a standard matrix for a non-abrasive, relatively solid and good coring formation; a hard matrix for a somewhat abrasive or fair coring formation; and a superhard matrix for an extremely abrasive or badly broken and difficult coring formation.



Aluminum Foot Valve

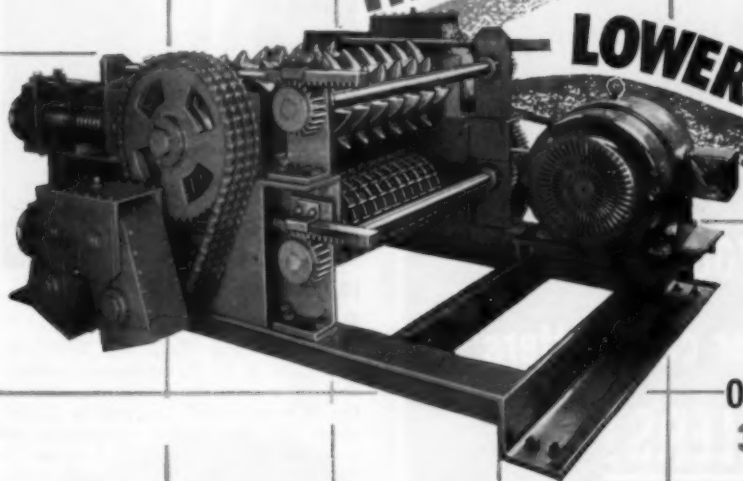
A heavy duty foot valve and strainer, so light that one man can handle it, has been developed by Clayton Mark & Co., Evanston, Ill. The valve weighs 41 lb in 8-in pipe size, half as much as the usual iron valve, and 19 lb in the 6-in pipe size. Tests have proven the valve resistant to corrosion and

the **HANNA*** story about... **GUNDLACH** crushers

The GUNDLACH CRUSHER
crushed more coal in 9 months
than previous crushers
crushed in a full year!

INCREASED PRODUCTION!

The GUNDLACH CRUSHER—
averaged 390 TPH
crushing over 1,000,000
tons with total
maintenance cost...
only \$318.00



LOWER MAINTENANCE!

Or a Maintenance Cost of
32¢ per 1000 Tons!

* In January 1956, Hanna's Georgetown, Ohio Preparation Plant, one of the largest coal cleaning plants in the United States, installed their first GUNDLACH Crusher which was required to reduce 7" x 1 1/4" washed coal to 1 1/4" top size at a rate of 350 TPH.

Prior to the installation of the GUNDLACH Crusher, Hanna encountered trouble with an over-size product (plus 1 1/4") overloading the recirculation screens and conveyors, which in effect decreased overall plant capacity.

Not only did the GUNDLACH Crusher more than meet the capacity required, but it also eliminated the overloading condition in the recirculating equipment which greatly increased overall plant capacity. In addition the GUNDLACH Crusher as compared to the crusher it replaced reduced the percentage of fines, consequently better screening resulted. It delivered an average of 390 TPH, crushing over a million tons from Jan. 13 to Oct. 31, 1956 and . . . at the relatively negligible low cost of only \$318.00 for total maintenance, broken down as follows:

Replacement Parts: (Includes welding rod for tooth build-ups).....	\$ 36.00
Labor: Hanna's actual cost for tooth build-ups and installation. (Some at overtime rate)	\$282.00
Total cost per 1,000,000 tons.....	\$318.00

BECAUSE OF THE OUTSTANDING PERFORMANCE OF THIS CRUSHER, HANNA HAS RECENTLY PURCHASED FOUR MORE GUNDLACH TWO-STAGE CRUSHERS.

Perhaps we can help you as we have helped Hanna. We have a crushing engineer in your area, just give us a call.

T. J. GUNDLACH MACHINE CO.
DIVISION OF J. M. J. INDUSTRIES, INC.
BELLEVILLE, ILLINOIS

Equipment News (Continued)

mechanical damage, according to the company. The top and basket of the valve are constructed of aluminum alloy castings; the body is threaded and machined for pipe assembly. Also aluminum-made is the valve seat ring, which is replaceable. The valve flap is made of canvas-reinforced rubber.

Motors Get Higher Ratings

General Electric Co. has announced a new line of AC induction motors from 40 hp to 125 hp. The motors are built to new NEMA standards, which assign a greater horsepower rating to a given motor frame size. At



General Electric this has resulted in increasing the rating of the 445U frame from 75 hp to 125 hp. In addition, weight reductions have been decreased an average of 20%, and lineal dimensions have been reduced an average of 10%, volume 27%. In the photo above the

new General Electric dripproof unit (left) is rated at 125 hp. Its predecessor (right) is a 75-hp unit. Address: General Electric Co., Small AC Motor & Generator Dept., Schenectady, N. Y.



New Compressor Announced

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., announces production of a new air compressor named the "Channel-Flo." The unit is a two-stage, 200 psig motor compressor and is made in 1½ and 2-hp sizes. A complete unit includes the motor-compressor, a cushioned rubber mounting on an ASME vertical tank, interconnecting piping, fittings, and an automatic stop-start control. The maker points out that Ingersoll-Rand designers consider the elimination of a belt drive an important safety and space saving feature. In the Channel-Flo the compressor is flange-mounted directly to the driving motor.

Ask the man

WHO HAS USED BOTH!

HE WILL TELL YOU WHY

he replaced his other car spotters
with STAMLERS!

WE SAID it before and we say it again: **DON'T BELIEVE US —** just ask the mining men who have had experience with **STAMLER Car Spotters** and with other car spotters. Then you will know why they switched to **STAMLERS**. Then you will believe that during the past year **STAMLERS** have replaced other car spotters many times in many, many mines. And the shift to **STAMLERS** continues at an increasing pace! But there's really no mystery about it. It's just that **STAMLER** equipment out-performs all other loading point equipment; that **STAMLER** equipment increases tonnage and reduces costs; that **STAMLER** equipment operates at the lowest possible maintenance figure! When are you going to join the swing to **STAMLERS?**

STAMLER
Hydraulic
CAR SPOTTERS

W. R. STAMLER CORPORATION
PARIS, KENTUCKY

SCHROEDER BROS., Exclusive Eastern Sales Agent
Pittsburgh, Pennsylvania
UNION INDUSTRIAL CORP., Carlsbad, New Mexico

SALMON & CO., Birmingham, Alabama
WESTERN SALES ENGINEERING CO.,
Salt Lake City, Utah



Lightweight Welding Unit

Hobart Bros. Co., Troy, Ohio, reports a new semi-automatic submerged arc welder designed as a compact, lightweight unit. The welder is equipped with all controls and a control power



Want to get there Quicker, Safer, at Lower Cost?

Eaton 2-Speed Axles Will Do It!

Eaton 2-Speed Axle trucks make quicker, full-load trips—with no sacrifice of power when it's needed to pull out of the tough spots. But they do more than save time; they save money, too. With double the conventional number of gear ratios right at their finger tips, drivers use the right gear ratio for every operating condition. This lets engines operate in their most efficient and economical speed range; stress and wear are reduced right down the line from the engine to the axle itself. Operating and maintenance costs are cut to the bone. And through improved maneuverability and reduced driver fatigue, Eaton 2-Speed Axle trucks make not only quicker trips but safer ones. They haul more at lower cost per mile, last longer, and are worth more when traded in.



More than Two Million
Eaton Axles in Trucks Today.
For complete information,
see your truck dealer.

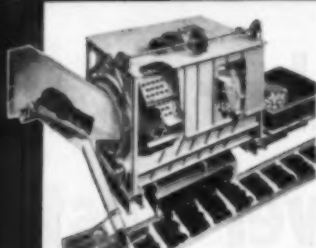
EATON

AXLE DIVISION
MANUFACTURING COMPANY
CLEVELAND, OHIO



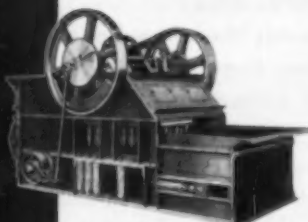
PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Forgings • Heater-Defroster Units • Automotive Air Conditioning Fastening Devices • Cold Drawn Steel • Stampings • Gears • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

America's most complete line of CRUSHING EQUIPMENT



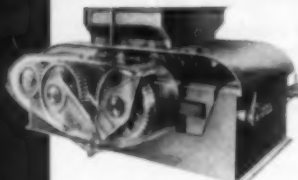
**McNally Pittsburgh
Rotary Breaker**

This unit allows positive control of top size in handling run-of-mine washery feed. Production of fines is held to a minimum.



**McNally Norton Vertical
Pick Breaker**

50% Less fines when reducing lump to egg and stove sizes.



**McNally Double Roll
Gearmatic ROM Breaker**

Built in tonnage ranges from 750 tph to 1400 tph. Full floating gearmatic drive.

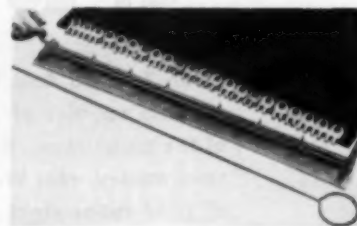


**McNally Gearmatic Stoker
Coal Crusher**

This unit offers three prime advantages: high volume production, plus accurate sizing, plus low percentage of fines.

Equipment News (Continued)

cable for plugging in on 110 v, DC or AC. In addition it is equipped with a wire reel, a caster mounted base, and carrying handles. A gun cable assembly is included with two welding guns—one fluxtype with hopper, the other an open arc type for welding without flux. The unit's wire feed speed control rheostat and electrical components are protected by steel cabinets which can be used as a single unit or separated for remote control, since each has its own carrying handle. Cooling is provided by bottom end openings and side panel louvers.



Holder Aligns Belt Fastener

A simple aligning holder said to speed and ease application of Flexco hinged conveyor belt fasteners is being marketed by the Flexible Steel Lacing Co., Chicago 44, Ill. The company points out these design advantages: 1) all fasteners are kept in alignment while nuts are being run; 2) bolts break off easily and quickly since the aligning holder keeps all fasteners and the belt end rigid; 3) the hinge pin is inserted easily; and 4) a No. 500 Templet is an integral part of the aligning holder, thus both these tools can be had as a single unit.

Chain Repair Link

A repair link for hoist and drag chains is being manufactured by Kensington Steel, Div. of Poor & Co., 505 Kensington Ave., Chicago 28, Ill. The link consists of two identical half links and

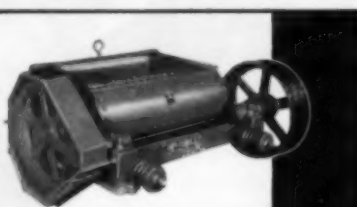


a combination key and wedge. To assemble the link the halves are inserted through the ends of the chain being repaired. When the wedge is driven into place the key is bent, automatically locking the link together. No welding, burning, and riveting are needed. Kensington says the repair link will be as strong or stronger than other links in the repaired chain.



Hoist's Lift Up, Weight Down

Lower bulk hauling costs reportedly will be the result for users of the Heil Co.'s new HMT series of single telescopic hoists, which, the company says, will increase legal dump-truck payloads. Two units, the HMT 63-102 and the HMT 63-117, have greater lifting capacity for dumping, and contain less dead weight than other models being sold. The weight savings have been achieved by using special alloy steels, manganese bronze sleeve bearings, and higher hydraulic pressure systems. Address: Heil Co., Milwaukee 1, Wis.



McNally Single Roll Crusher
Universal application 20", 24"
and 36" diameter rolls.

AVAILABLE

From Stock and on Short Delivery

For immediate action on complete information write,
wire, or call.

McNALLY PITTSBURG MFG. CORP.

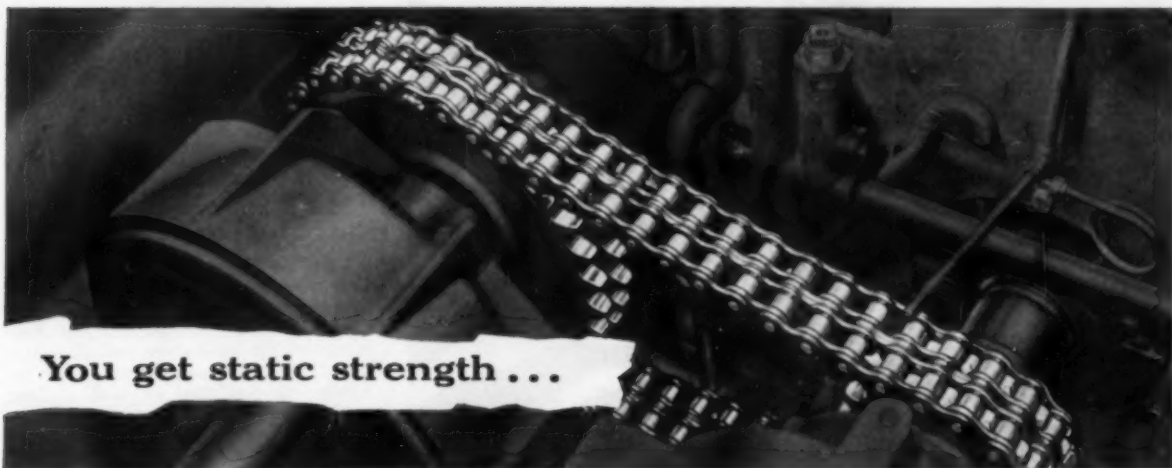
Pittsburg, Kansas

Wellston, Ohio

Pump Has One Moving Part

The Corley "Magnallow" pump, which the manufacturer says is the "simplest pump you ever saw," is a centrifugal unit magnetically driven by currents generated by a stator outside the housing. Only one part moves—the rotor-impeller, which operates within a stainless steel sleeve that isolates the pumped

Why tough-service drive and conveyor jobs demand LINK-BELT roller chain



You get static strength . . .

RESISTANCE TO TENSILE STRESS is achieved with properly heat-treated, accurately machined side bars made of premium steel and fitted with properly hardened pins, bushings, rollers.



plus dynamic strength

STRENGTH OF CHAIN IN MOTION results from such refinements as pitch-hole preparation, micro-finish of parts, special processing of side bars, pre-lubrication, rigid quality control.

THE greater dynamic strength found in Link-Belt precision steel roller chain is essential for long life on today's harder-working drives and conveyors. This added capacity to resist shock loads, centrifugal loads and similar stresses is achieved only because Link-Belt adds refinements in manufacture.

These include lock-type bushings, shot-peened rollers, pre-stressing, closer heat-treat control. The result: a precision chain that takes stresses in stride . . . provides smoother, more efficient performance

that measurably outlasts ordinary roller chain — reduces costs.

For full data on Link-Belt roller chain, see your Link-Belt office or authorized stock-carrying distributor.

LINK-BELT
ROLLER CHAIN & SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

14-472



*First step to
successful blasting...*

AUSTIN EXPLOSIVES

Each blasting operation has conditions which make it unique. These may be in the form of hardness of the rock to be shot, excessive moisture, fragmentation desired... or the amount of ventilation available if working in underground areas.

Austin produces an explosive to successfully meet every combination of conditions. Among its complete stocks are ammonia grades, ammonia gelatins, permissible dynamites, nitroglycerin and nitroglycerin gelatins.

AUSTIN AKREMIT

A popular item in the Austin line is Akremite. This combination of insensitive ammonium nitrate with carbon is safer... simpler to use... easier to store. Where applicable, it can cut blasting costs up to 50%.

There is an Austin explosives engineer in your area. He'll be glad to survey your job requirements and make common sense suggestions on how you can cut costs and increase production with Austin explosives.

AA-401



AUSTIN
POWDER COMPANY
CLEVELAND 13, OHIO

explosives ♦ permissible dynamites ♦ mine tools
detonating fuse and clips ♦ AP drill heads ♦ Akremite ♦ primers

Equipment News (Continued)



fluid from the stator. The pump's design permits only two friction points, its front and rear bearings. Pumped fluid lubricates the mechanism and dissipates heat. The pumping chamber can be totally enclosed, and no seal, stuffing box or lubrication ports are present. Thus, there is nothing to prevent building up the housing to withstand any desired pressure, the manufacturer points out. Another result is that bulk is cut to one-quarter that of conventional centrifugal pumps. The manufacturer adds that units are made in $\frac{1}{16}$, $\frac{1}{8}$, and $\frac{1}{4}$ -hps and in four metals—cast iron, bronze, stainless steel, and aluminum. There are five sizes— $\frac{3}{4}$ in., $\frac{1}{2}$ in., $1\frac{1}{2}$ in., and 2 in. Address: Corley Co., Inc., 103 E. Main St., Plainville, Conn.



Adjustable Speed Drives

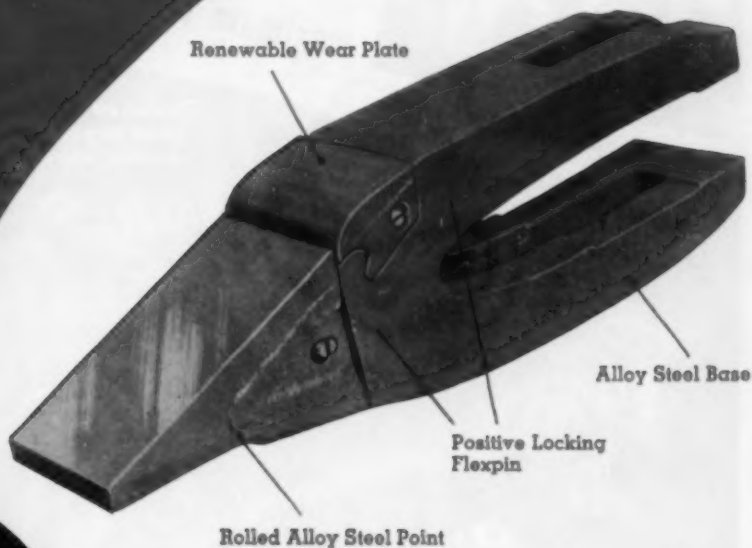
Two "C" groove adjustable speed drives have been added to the standard line of the American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa. The company says the two additions were designed as a result of greater horsepower transmitting capacity being built into the company's American Super-Service Wedgbelts. American Pulley says that it is generally more economical now to select two "C" Groove Super-Service Belts in place of four or five "B" groove belts when driving in the horsepower range of 15 to 20 hp, and motor speeds of 1,160 and 1,750 rpm. In addition, the new drives permit stepless speed adjustments up to 26%.



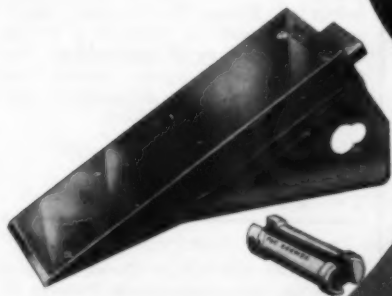
Take advantage of
EXPERIENCE specializing exclusively
in the manufacture of

Teeth that really dig

There is no
substitute for
**FORGED
ALLOY STEEL**



Whistler type shanks for 8 or 10 yd. shovels
with renewable wear plate and forged tooth
point. Both wear plate and point securely
attached with H & L flexpin.



ALL H & L POINTS ARE MADE OF ROLLED HIGH
ALLOY STEEL (NOT CAST)


The majority of bases and adapters are also made
of rolled high alloy steel.

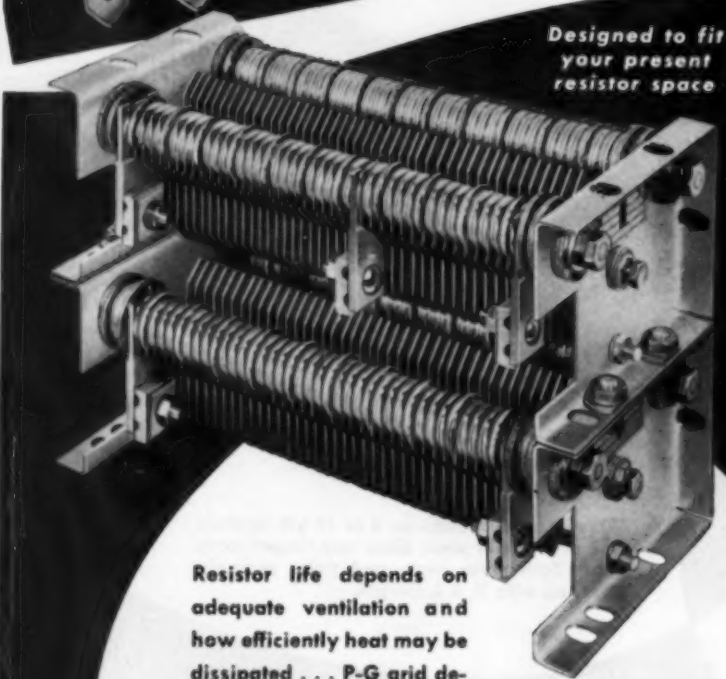


TOOTH COMPANY

1540 SOUTH GREENWOOD AVE. MONTEBELLO, CALIFORNIA

Resistor life depends on adequate ventilation...

Patented  Grid Design assures maximum ventilation



Designed to fit your present resistor space

Resistor life depends on adequate ventilation and how efficiently heat may be dissipated . . . P-G grid design equalizes the amount of air space surrounding each leg or loop to obtain even heat throughout the grid area. (Note illustration.) . . . Since heat is rapidly and evenly dissipated, hot spots fail to develop and longer resistor life is assured . . . For a nonbreakable resistor (only steel and mica used) specify P-G on your next application.



THE POST-GLOVER ELECTRIC COMPANY

ESTABLISHED 1901

221 WEST THIRD STREET, CINCINNATI 2, OHIO

Equipment Shorts

TIRE VALVE EXTENSIONS—Over-size tire valve extension kit for off-the-road vehicles contains materials to make extensions up to 24 $\frac{3}{4}$ in. Included: 10 lengths of tubing with ends attached; 10 lengths of woven loom; 10 ends for valve cores; jam nuts; lock nuts; solder rings; and silver solder flux. Dill Mfg. Co., 700 E. 82nd St., Cleveland 3, Ohio.

WELDING ATTACHMENT—Lincoln Electric Co.'s new Power Pack attachment for the company's 500-amp combination AC and DC Idealarc welder permits use of the welder as a power source for the Manual Lincolnweld, ML-2, semi-automatic submerged arc welder. With the Idealarc welder, the ML-2 submerged arc welder, and the Power Pack, users have a package that is capable of welding with DC or AC and capable of submerged welding with DC. Cleveland 17, Ohio.

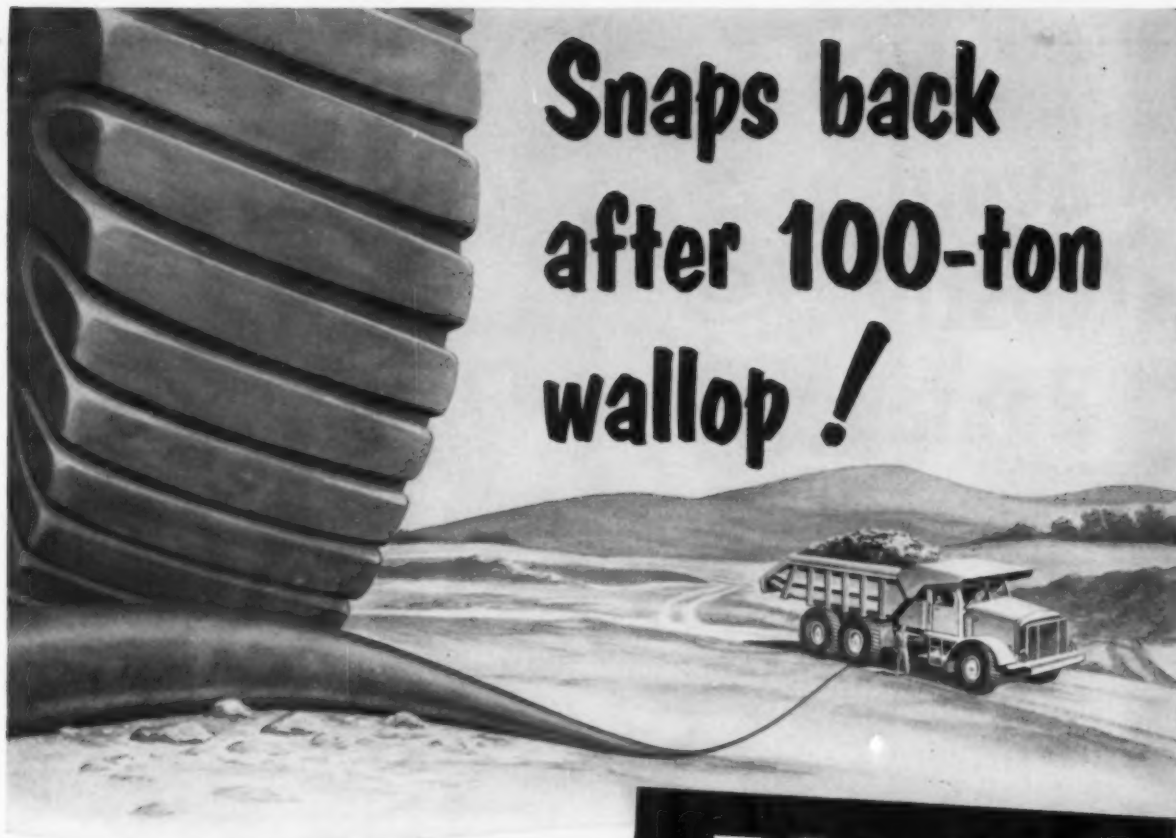
WELDING, CUTTING—A light duty welding and cutting outfit made by Air Reduction Co., Inc., 150 E. 42d St., New York 17, N. Y., will weld, braze heat, and cut. It will weld up to $\frac{3}{16}$ in thick, or to $\frac{5}{16}$ in with large tips. Steel plate up to 1 in can be cut. Included are regulators, hoses, torch, mixer, two tips, cutting attachment, wrench, sparklighter, and goggles.

FLOODLIGHTING—Two new series of weatherproof wiring troughs and splice boxes made by Stonco Electric Products Co., Kenilworth, N. J., are made of cast aluminum and permit unlimited floodlighting clusters. Clusters can be arranged to provide a wide-angle sweep of light or a high intensity pencil beam. Trough holes fit any standard lamp-holder of fitting. The troughs, themselves are made in sizes 9 in to 22 in and hold up to 12 lampholders. The splice boxes are square, round, and hexagon and can be adjusted to permanently fix floodlighting focus.

Free Bulletins

TRACTOR SHOVELS—Operating, performance, and maintenance features of the Allis-Chalmers HD-16G and the HD-21G tractor shovels are described in Catalog MS-1102. The catalog, which includes engineering, design, and construction data, is available from the company's Construction Machinery Div., Milwaukee, Wis.

LEADED ALLOY STEEL—Rycut 40, a chromium-molybdenum .40 carbon alloy steel containing lead, is described along with reported advantages by the manufacturer, Joseph T. Ryerson & Son, Inc., in Bulletin 14-5. The bulletin is available from the company at Box

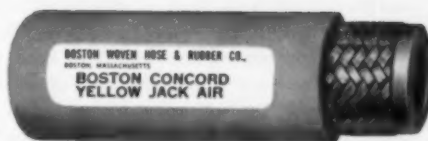


Snaps back after 100-ton wallop!

This is the hose built to take the most brutal treatment. So strong it snaps back even after being battered by a loaded Model LLD Euclid — a gross weight of 203,300 pounds!

When you consider that 45% of air hose failure is caused by *external* conditions, Boston Concord Yellow Jack is definitely the air hose to choose for your toughest jobs. It has the stamina to handle repeated rugged impact . . . the strength to withstand the highest internal pressures.

BOSTON
concord yellow jack
AIR HOSE



Boston Concord Yellow Jack's bright yellow cover makes it easy to identify.

Whatever your hose needs, there's a BOSTON Hose for you . . . and a BOSTON man nearby to help you solve your problems.

BOSTON

BOSTON WOVEN HOSE & RUBBER CO.
BOSTON 3, MASSACHUSETTS



INDUSTRIAL HOSE



BELTING



V-BELTS



PACKING

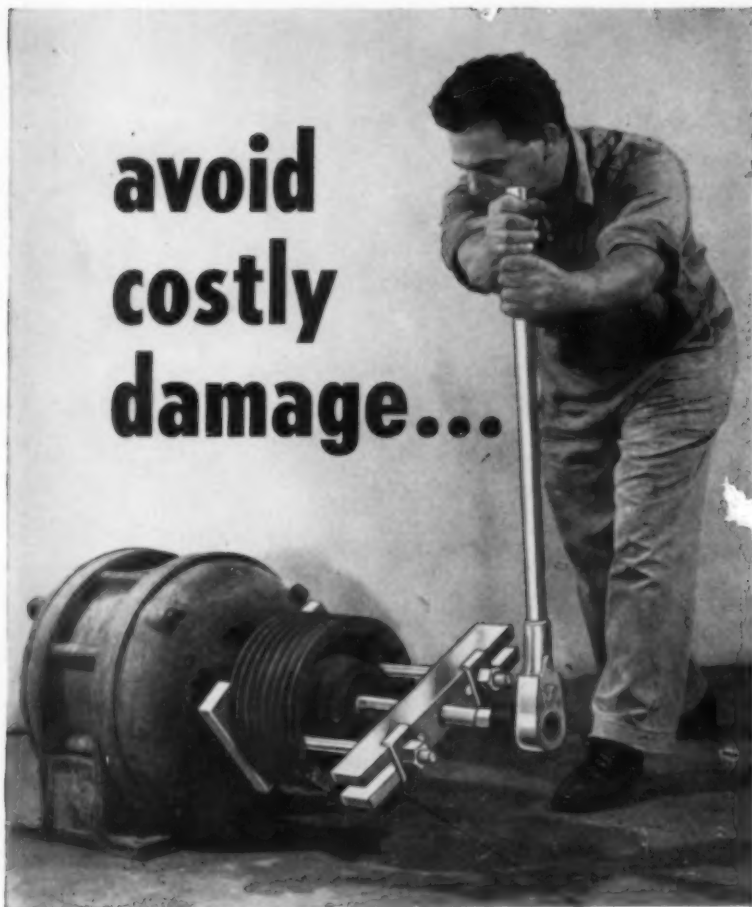


MATTING



TAPE

**avoid
costly
damage...**



REMOVE PARTS SAFELY WITH

Snap-on PULLER TOOLS

Snap-on pullers handle a wide range of pulling jobs safely, easily, quickly — protect expensive wheels, gears and other parts from damage — save hours of labor time. *Snap-on* builds a complete line of pullers with pulling pressures ranging from a few pounds to over 50 tons. You handle the toughest pulling jobs without the smashing sledge blows and shocks which can ruin expensive machinery.

Interchangeable parts, special adapters

Snap-on makes special adapters, reversible jaws and interchangeable parts that permit you to use one basic puller set for many jobs. Jaw-type pullers are designed to lock on to the job — eliminate slipping and binding.

Snap-on offers a complete line of over 4,000 industrial and mechanics tools. Send for your copy of new *Snap-on* Catalog V now.



*Snap-on is the trademark of Snap-on Tools Corporation.

SNAP-ON TOOLS CORPORATION

8132-F 28th Avenue, Kenosha, Wisconsin

Equipment News (Continued)

8000-A, Chicago 80, Ill. Ryerson says that longer tool life, closer tolerances, and better finishes are made possible by Rycut 40.

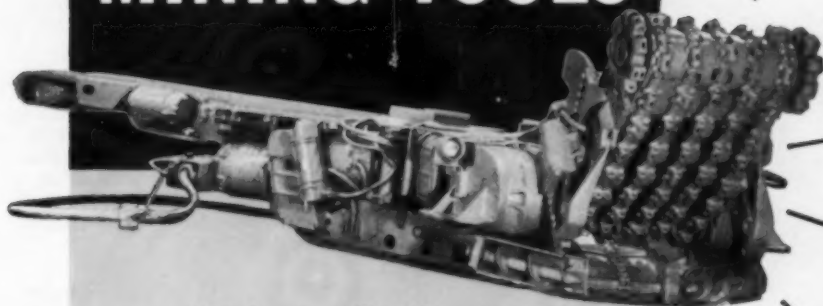
INDUSTRIAL BATTERIES—A revised reference catalog on motive-power batteries contains text on new features of Exide-Ironclad units. New sections on Silvium alloy used in positive grids have been included. Reproductions of service records indicate that the batteries have given from 7 to 10 yr working life in industrial trucks and mine locomotives. Form 5161, The Electric Storage Battery Co., Box 8109, Philadelphia 1, Pa.

HOSE NEEDS—A 40-p catalog covering hose, hose ends and assemblies is being distributed by the Weatherhead Co., Customer Service Dept., 128 West Washington Blvd., Fort Wayne, Ind. The catalog contains the entire Weatherhead line, and features "at-a-glance" charts for selection. More than 180 elements are shown.

ELECTROMAGNETIC CONTROL — The Automatic Switch Co., Florham Park, N.J., is distributing in response to letterhead requests seven electromagnetic control catalogs. The company manufactures ASCO electromagnetic control and solenoid valves. Catalog 57-S1 covers automatic transfer switches designed to transfer a load from a normal source to an emergency source upon failure or reduction in voltage at the normal sources. Catalog 57-S2, which covers remote control switches, contains information on power control and lighting circuits from any number of control stations. Catalog 57-S3 describes ASCO magnetically held contactors, which are designed to permit unlimited combinations, including multi-pole, special contact arrangements and other "engineered-to-fit" features. Catalog 57-S4 describes ASCO relays, which are magnetically or mechanically held and may be obtained in unlimited pole combinations. In addition, special purpose relays are listed. Catalog 57-S5 includes AC and DC solenoids, including the company's program of manufacturing solenoids to customer specifications. Catalog 57-S6 covers electric plant controls, including complete systems, paralleling, change-over, and alternating panels, load demand controls, battery chargers, and adapter units. Catalog 57-S is Automatic Switch Co.'s complete electromagnetic control catalog. It contains most of the information appearing in Catalogs 57-S1 through 57-S6.

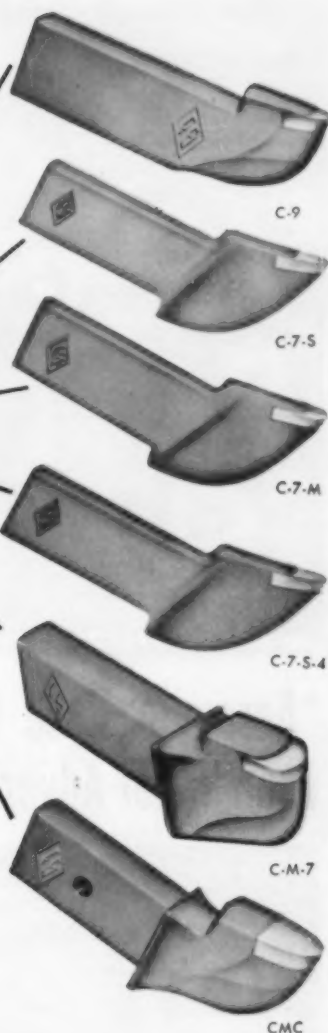
HYDRAULIC HOSE FITTING—Bulletin 4433B1, which is being distributed by the Tube & Hose Fittings Div., Parker Appliance, hangs on a wall and contains instructions for the two steps required to assemble non-skive Hoze-lok fittings and rubber-covered, wire braid hose. Company address is 17325 Euclid Ave., Cleveland 12, Ohio.

FIRTHITE Blue-Bit MINING TOOLS



Wide Tool Selection
for use on ...

JOY
CONTINUOUS MINERS
for every mining condition



This powerful behemoth of the coal mines, and other mammoth counterparts, depends upon its "teeth" of Firthite carbide inserts for fast, dependable, economical mining.

The FIRTHITE Blue-Bit line provides a full complement of cutting tools for each position on the cutting chains and pineapples and for every type of cutting condition. Recommended tools are tabulated at the right, each one designed to do the best possible cutting job at the lowest possible cost.

A Firth Sterling mining tool engineer will be glad to discuss your problems.

YOUR AUTHORIZED FIRTH STERLING MINING DISTRIBUTORS HAVE COMPLETE STOCKS FOR IMMEDIATE DELIVERY.

RECOMMENDED TOOL NUMBER*		Cutting Conditions	Cool	Holder
CHAIN PINEAPPLE				
C-9	C-7-S	LIGHT TO MEDIUM	Relatively Clean	1/2" x 1"
C-7-S C-7-M	C-7-S C-7-M	MEDIUM TO HEAVY	Occasional Impurities	1/2" x 1"
C-7-S-4 C-7-M C-M-7	C-M-7 CMC	HEAVY	Large Quantities Clay Sulphur Rock, etc.	1/2" x 1"

Firth Sterling

—INC—

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

DISTRIBUTED BY:

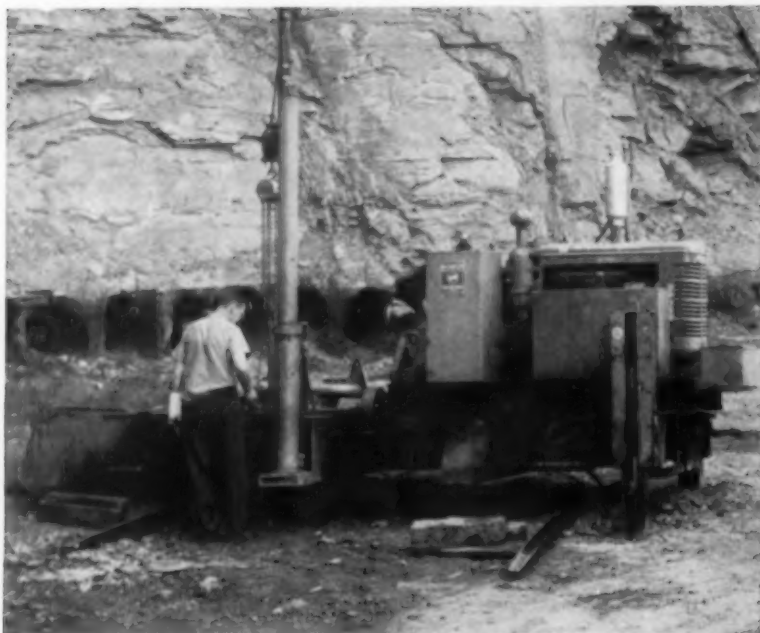
AUSTIN POWDER COMPANY—Cleveland, Waynesburg, Evansville, Madisonville, Hazard, W. Frankfort, Clarksburg	• DUNLAP WELDING & SUPPLY—Zanesville
UNION SUPPLY COMPANY—Denver	• MOLE-BITS COMPANY—Johnstown
AMOS A. CULP—Birmingham	• U. S. STEEL SUPPLY DIVISION—Pittsburgh
McCOMB SUPPLY COMPANY—Harlan	• CARL B. LEWIS—Scranton
CARLSBAD SUPPLY COMPANY—Carlsbad	• GUYAN MACHINERY—Logan
SERVICE SUPPLY COMPANY—Wheeling	• THE RAINS SUPPLY CO.—Salt Lake City
	• SOUTHWESTERN ILLINOIS SUPPLY—DeSoto
	• COAL BIT COMPANY—Prestonsburg

*FS style CMD available for
Drum (Roller) Type Machines

R-329

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels		Sintered Tungsten Carbides
Tool & Die Steels		Firth Heavy Metal
Stainless Specialties		Chromium Carbides
High Temperature Alloys		High Temperature Cermets
		Zirconium



Aeroquip Hose Lines are used for fuel and high pressure hydraulic applications on this rock and earth drill.

"Aeroquip Hose Lines are Trouble-Free Even Under Adverse Working Conditions"



Highly flexible Aeroquip Hose installs easily, withstands vibration and shock on this auger engine.

**Says S. Corte, Owner
Corte Construction Co.,
Kimble, West Virginia**

In this West Virginia strip mining operation, Aeroquip Flexible Hose Lines help keep two McCarthy augers working up to 20 hours a day, 225 days a year. Although the Aeroquip Hose Lines on these augers are punished by weather, extreme vibration, jarring and rough handling, Mr. Corte reports: "No hose line trouble."

Corte Construction Co. uses Aeroquip Hose Lines for many applications on a variety of heavy equipment: 1525 Hose for engine fuel lines and air lines; 1509 Hose for high pressure hydraulic cylinder lines; 1503 Hose for hydraulic jacks, control valves, power steering lines and oil and grease lines.

All Aeroquip Hose types have reusable fittings which permit quick hose line replacement in the field, when necessary. Your Aeroquip Distributor can give you complete information. He's listed in your Yellow Page Phone Directory, or write us.



Aeroquip

AEROQUIP CORPORATION, JACKSON, MICHIGAN

IN CANADA: AEROQUIP (CANADA) LTD., TORONTO 10, ONTARIO
LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U. S. A. AND ABROAD
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

Equipment News (Continued)

STOPPING MASONRY LEAKS — Stonhard Co., Inc., 1306 Spring Garden St., Philadelphia 23, Pa., will send a 6-p folder on how to stop leaks and water seepage in above or below ground masonry without expensive excavation, special tools, and costly delay. The method involves using "Stontite," a chemical which reportedly stops water flow in 5 min. even against hydrostatic pressure. The chemical is mixed with fresh Portland cement for use.

OUTDOOR MOTORS—The construction of its outdoor, weather-protected motors is explained by Allis-Chalmers Mfg. Co., Box 512, Milwaukee, Wis., in Bulletin 51B8606A. The motors, constructed in ratings from 250 to 900 hp, are described feature by feature, with emphasis on outdoor designs.

HYDRAULIC CYLINDERS — Bulletin 57-68, published by Vickers, Inc., 10541 Puritan Ave., Detroit 32, Mich., shows recent design improvements and additional mountings for the company's "Compact" hydraulic cylinders. Detailed information is given on 2,000-psi cylinders, including the new trunnion-mounted type.

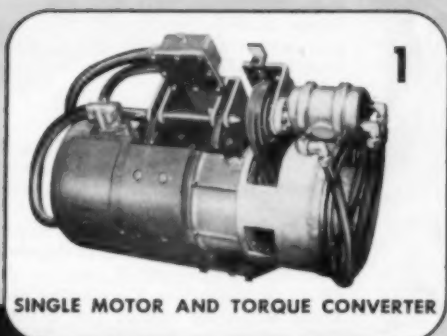
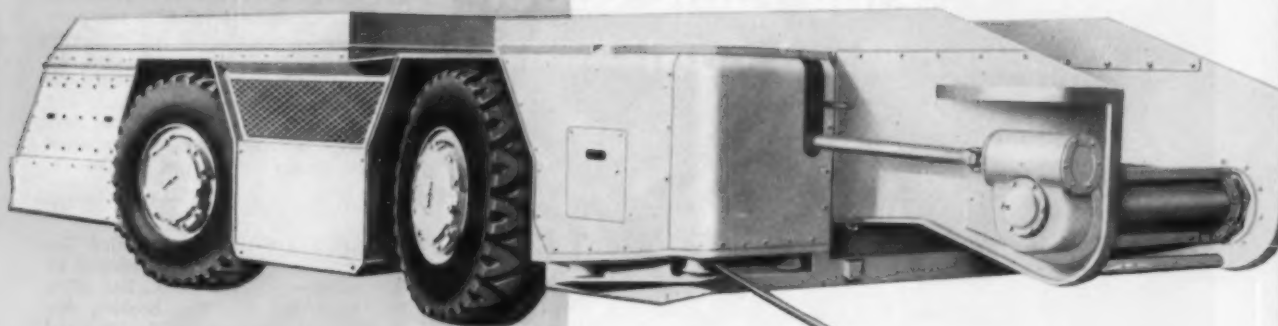
COUPLING—Bulletin 270, published by Snap-Tie, Inc., Union City, Pa., contains descriptions of the new "quick-connect, quick-disconnect" HK coupling. The use of Teflon seals is described as are the coupling's resistance to acids, alkalis, solvents, and steam.

TRACTOR-LOADER, TRACTOR-EXCAVATOR TIPS — Eimco Corp., 634 South Fourth West, Salt Lake City, Utah, is offering new manuals for operators of Eimco Model 105 tractor-excavators and Model 105 front end loaders. Brochure B-L1055 offers efficiency tips on the tractor-excavator, in addition to supplying information on preventive maintenance. Brochure B-L1056 points out ways of efficient operation of the loading attachment, and offers tips on operating a fork lift attachment.

DIESEL REPAIRING—"Principles of Trouble Shooting for Cummins Diesels," a wall chart published by the Service Div., Cummins Engine Co., Columbus, Ind., advises to "think before you act." Trouble shooting is no more than "an organized study of a problem and a planned method of procedure," according to the bulletin, which contains a table of complaints and causes of complaints.

OFF-HIGHWAY TRUCKS — International Harvester Co., Construction Equipment Div., 180 No. Michigan Ave., Chicago 1, Ill., is distributing an 8-p folder describing the 24-ton "95" and the 18-ton "65" trucks. On the job reports supplement descriptions. Booklet CR-592-G.

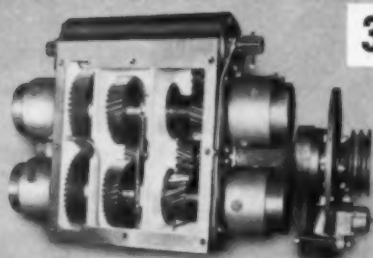
Engineered for Rugged Service and Economy



SINGLE MOTOR AND TORQUE CONVERTER



INTERCHANGEABLE WHEEL UNITS



CONSTANT-MESH TRANSMISSION

the new National Mine ***TORKAR****

A.C. or D.C. Shuttle Car

1 A single, large, non-reversing A.C. or D.C. motor amply provides all the power requirements of the new National Mine Torkar and effects substantial savings in motor maintenance. Electrical controls and wiring are at a minimum, further reducing maintenance costs. The motor drives through a torque converter which allows the motor to operate in its most efficient range, prolonging motor life, eliminating the possibility of thermal damage to the motor and conserving current.

2 New type wheel units of heavy automotive design are a feature of the Torkar, and all four are identical and interchangeable. They employ a spiral tooth spur gear-and-pinion drive running in oil. The units are not adversely affected by housing misalignments, and are extremely rugged and durable.

3 Three speeds forward and reverse are provided by the constant-mesh transmission, which permits selection of the gear ratio best suited for the roadbed or grade, eliminates "jogging," and provides dynamic braking. The transmission makes possible the use of a highly efficient non-reversing motor, protects the motor against overloading, reduces wear on the service brake and further reduces power consumption.

For complete details on how the Torkar can reduce your shuttle car costs, consult your National Mine representative or write.

**National Mine
Service Company**



National Mine Service Company

564 Alcoa Building • Pittsburgh 19, Pennsylvania

All-State Division Logan, W. Va.	Anthracite Division Forty Fort, Pa.	Ashland Division Ashland, Ky.	Bemeco Division Beckley, W. Va.	Clarkson Division Nashville, Ill.
Kentucky-Virginia Division Jenkins, Ky.	Western Kentucky Division Madisonville, Ky.	Whiteman Division Indiana, Pa.	Morganstown, W. Va.	

*Trademark

U.S. Bureau of Mines

Reduce Picking Table Labor ...Recover More Coal!



AMERICAN Heavy Duty "S" CRUSHER

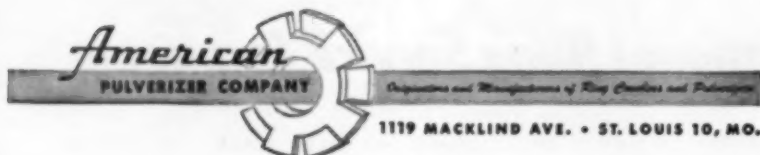
**CRUSHES ROM COAL, ROCK, SLATE, SULFUR BALLS
AND GOB...WITHOUT OVERSIZE**

A dozen installations of the new Heavy Duty "S" Crusher prove that it cuts labor costs by eliminating men at the picking tables.

It also offers important savings in recovered coal—coal that was formerly thrown away because of imbedded impurities. It is now crushed and washed for reclamation.

By cutting labor costs, by adding to your output, the new Crusher pays for itself in less than a year. From then on it's clear profit.

WRITE FOR LITERATURE.



Equipment News (Continued)

ALUMINUM-COATED STEEL—Armco Steel Corp.'s Bulletin PO 5658 tells how to get long service life at low cost with aluminized (aluminum-coated) steel for building products. Among the products are roof decks, roofing and siding, rolling doors, and roof ventilators for steel buildings. Address: Product Information Service, Armco Steel Corp., Middletown, Ohio.

GEARING—A new booklet entitled "Industrial Gearing" is being distributed by Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa. The booklet, No. B-7012, outlines the design facilities and manufacturing capacity of the Westinghouse division. Specialized machinery and heat-treating equipment are shown. Also included is a complete machinery listing.

AIR SYSTEM FILM—The Education Committee of the Compressed Air & Gas Institute has made available a 16mm sound-color film entitled "Overworked and Underpowered." The film's purpose is to invite air power users to survey and examine the air systems in their plants. It shows how a correction of 3% faults in an air system can result in 95% savings in production efficiency. Information from Edmond C. Powers, Educational Committee, Compressed Air & Gas Institute, 1400 Terminal Tower, Cleveland 13, Ohio.

RADIO TONE SQUELCHER—General Electric's Communication Products Dept., Electronics Park, Syracuse, N. Y., explains in Bulletin ECR 449 the "Channel Guard" tone squelch device manufactured for two-way radio systems. Included are descriptions of how unwanted signals and transmission can be avoided and how the device can be installed in new or old systems.

PETROLEUM PRODUCTS SELECTION—Standard Oil Co., Sales Technical Service Dept., 910 So. Michigan Ave., Chicago 80, Ill., is publishing MQ-215, an engineering bulletin on "Maintaining the Quality of Petroleum Products." The 64-p bulletin includes refinery handling and storage, petroleum products contamination in service, preventing contamination, industrial applications, storage of fuels, storing and handling white oils, petrolatums, and waxes.

MAINTAINING TRANSFORMERS—A 50-p booklet published by Westinghouse Electric Corp. provides "Timely Tips on Transformer Maintenance." The booklet, No. B-4716-B, includes general inspection procedures, classification of transformers, drying out methods, and transformer connections. Written for maintenance men, the booklet is available from Westinghouse at PO Box 2099, Pittsburgh 30, Pa.

The chain that...



thrives on abuse!

Standard Rivetless Chain available in 4" to 9" pitches to fit standard equipment.

The more it's used the harder it gets!

That's because it's made from KENKROME, the remarkable wear-defying alloy that was perfected after years of experimentation by Kensington engineers and metallurgists.

KENKROME is no ordinary steel ... in fact it's no ordinary manganese steel. There's no other steel quite like it.

Addition of special alloying metals under a patented process, plus Kensington's own scientific method of heat treatment, have created this remarkable metal which outwears ordinary steel 2 to 4 times ... which actually defies wear by developing surface hardness under impact to better enable it to withstand abrasion. Beneath this continually hardening surface, the metal always re-

mains tough ... better able to withstand shock than metals that are hard all the way through.

But Kensington's wear-conquering engineers didn't stop with development of the metal itself. They improved the design of many standard parts ... reinforced those which needed strengthening ... reduced the number of moving and wearing parts on some ... reshaped others to add extra service life.

The renewable tooth sprocket, shown at the right, is a good example of Kensington's improved design. When outer segments need replacing, the entire change can be completed by a couple of men during lunch hour ... without even removing the chain. A new set of teeth costs only a fraction of what you'd pay for a complete one-piece sprocket.



KENKROME chains and sprockets are built to fit all standard conveyors and elevators used in mines and preparation plants. Consider the low initial cost, low replacement cost, and advantages of continuous, uninterrupted plant operation. It will pay YOU to Switch to KENKROME!

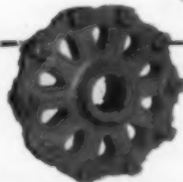
To find what it would cost, fill in and mail coupon. You'll be under no obligation.

Other wear-resisting alloyed ORO manganese replacement parts



Long-wearing, long lasting dipper tooth points and bases.

Treads for all sizes and types of shovels and draglines.



Crawler sprockets available for most shovels and draglines.



Kensington

STEEL

KENSINGTON STEEL, Dept. C, 505 Kensington Ave., Chicago 28, Ill.

DIVISION OF FORD & TOWNEY, CHICAGO

☐ Please quote prices

☐ Please ask salesman to call

Chain Information { CHAIN NO. _____ TYPE _____ LENGTH _____
ATTACHMENT NO. _____ SPACED EVERY _____ PITCH _____
(OR 2 BOLT PINS)

Sprocket Information { CHAIN NO. _____ NO. TEETH _____ SHAFT DIA. _____
HUB LENGTH _____ CENTRAL ☐ KEYWAY ☐
OFFSET ☐ BUSHED ☐

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



RECORDS* PROVE

**Twice the
rope life**

**Case histories show the proof. Yellow Strand Flattened Strand Wire Rope is making records of double the life, and even more, compared to round strand construction wire ropes. Ask your distributor, or write us for actual records on its performance.*

... with YELLOW STRAND Flattened Strand Wire Rope

It has greater surface area! It has 10% greater strength! It's more crush resistant! It gives up to double, or more, the life of round strand rope! These are, briefly, the profitable advantages of Yellow Strand Flattened Strand on your dozers, scrapers, draglines, trench hoes and hoist lines.

And Yellow Strand Flattened Strand is "always on hand" at your nearby Broderick & Bascom distributor. You can depend on his specialized

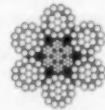
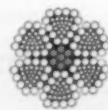
"know how" in recommending the right rope for your equipment. You can benefit by his prompt attention to your needs—backed by nationwide factory and warehouse stocks by B & B.

Specify Yellow Strand Flattened Strand on your next wire rope order and get the proof of lower overall costs and longer life. Ask your nearest B & B distributor, or write direct to us for more information on all your wire rope needs.



Here's Why Flattened Strand Lasts Longer

Compare Yellow Strand Flattened Strand with round strand wire rope (at right). In Flattened Strand you have twelve contact points, greater bearing area, smoother surface, less wear. Result: longer service, lower final cost.



BRODERICK & BASCOM ROPE CO.

Manufacturers of Wire Rope for over 80 Years

4203 Union Blvd. • St. Louis 15, Missouri

Factories and Branches throughout the U.S.A.



Open pit worker available

HAS FOUR-YARD SHOVEL...WILL TRAVEL

Will travel . . . there's the key to the real value of an Allis-Chalmers HD-21G tractor shovel. It not only digs and loads four yards at a pass, it is mobile enough to work in all parts of the pit . . . and flexible enough to do many different jobs well.

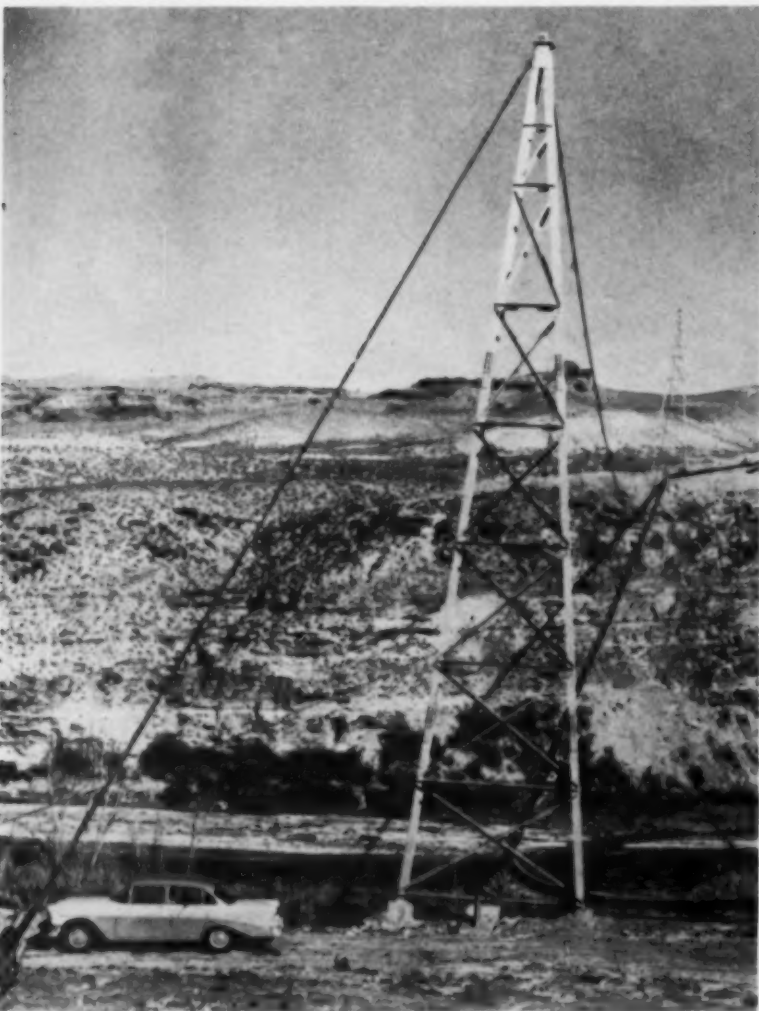
Besides loading hauling units, the HD-21G can strip over-burden, help maintain access roads, build stockpiles, feed and clean up around conveyors, or even clear land for future operations.

Let your Allis-Chalmers dealer show you the many ways an HD-21G can put its big, four-yard shovel to work profitably for you. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Engineering in Action

NEWS ROUND-UP



SUSPENSION BRIDGES carry solids pipeline over Utah's White River and canyons. Otherwise, the line is buried 3½ ft beneath frostline.

72-Mi Utah-Colorado Pipeline Begins Operating

The second major pipeline to transport solid materials went into operation last month between Bonanza, Utah, and Gilsonite, Colo. The line, a 6-in pipe, will carry "Gilsonite," a coal-like mineral, from the American Gilsonite Co. mines at Bonanza to a new refinery in Colorado 72 mi away.

The line is carrying a mixture of crushed Gilsonite ore and water, which will be converted into metallurgical coke and into gasoline. For much of its length it crosses uninhabited country and scales some of the west's most rugged terrain.

It spans two large canyons (photo) and crosses an 8,500-ft mountain pass. Most of its length is buried 3½ ft beneath the frostline.

From the mines in Bonanza the pipeline will transport 700 tpd of 8 mesh particles, following the route of the abandoned Uintah RR. At the mine itself, new hydraulic methods will yield ore in an already prepared slurry.

The pipeline is the result of 6 mo of testing, which confirmed preliminary evaluations. One of the major factors establishing design was the particle size of the Gilsonite. Although the pumps being used were able to handle ¼-in particles, results were improved greatly with 8 mesh.

The smaller particles also decreased

degradation, made dewatering easier, and made maintaining suspension within the line easier.

The entire 72-mi length lies on "a reasonably flat slope," except for 2 mi beyond the summit of Colorado's Baxter Pass, where 21-deg slopes were necessary. During the early operations a solids concentration of 35% Gilsonite and 65% water will be sent through the line. Uniform slurry will be maintained by 200,000-gal tanks at the Bonanza end, which will receive water from the nearby White River.

The pipeline is designed for continuous flow, and will be shut down only after all slurry is flushed from it. Three electric-slurry pumps, two active and one spare, drive the slurry at the Bonanza end. If power should fail, a diesel-driven pump will cut in and flush the system with water. A final protective measure is an 8,500-ft high reservoir at the summit of Baxter Pass. The reservoir's water can be used to flush the system in both directions.

American Gilsonite, however, sees little danger of the line plugging, since pilot tests showed that as long as velocities were maintained, slurry could be continuously circulated without a solids buildup. Maintaining the velocity are 300-hp reciprocating pumps, which work at a rate of 325 gpm and discharge at a pressure rate of 2,370 lb per sq in.

American Gilsonite announced it would construct the pipeline in July, 1956 (*Coal Age*, August, 1956, p 124). The refinery at Gilsonite, Colo., near Grand Junction was also announced at the same time. In it the company will produce conventional petroleum products from solid hydrocarbons on a large scale.

Several factors are said to have influenced the company, which is an affiliate of the Barber Oil Corp., New York, N. Y., and Standard Oil Co. of California, to construct the line. The ideal refinery location, for one, considering the availability of markets, was Colorado's Grand Valley. Trucking ore from the mine would be too expensive since the refinery required large quantities of ore. The Uintah RR, a defunct operation, would be too costly to reinstate. The answer was the pipeline, which finally was built at a cost of \$2 million.

Million-Kw Plant Will Burn 2-3 Million Tons of Coal

A super generating station capable of producing 1 million kw is being planned by the Southern Electric Generating Co. on the Coosa River in Alabama. The company, which is owned jointly by the Alabama Power Co. and the Georgia

MINING MACHINE AND LOAD
 SCRAPER AND DOZER ROPE-
 SLUSHER ROPE-WINCH LINE
 INCLINE ROPE-MINING MACHINE
 SHOVEL ROPE-DOZER ROPE
 MINE HOIST ROPE-SCRAPER
 AND LOAD ROPE-SLUSH
 STRIP SHOVEL AND DRAGLIN
 MINE HOIST
 WINCH LINES
 AND LOADER
 INCLINE ROPE
 DOZER ROPE



WHYTE STRAND

wire ropes are made to meet the needs of today's high output machines. There is a WHYTE STRAND wire rope in the correct size and construction for each use on every machine. These Macwhyte Ropes are PREformed for maximum flexibility, internally lubricated for super service and stocked for immediate delivery.

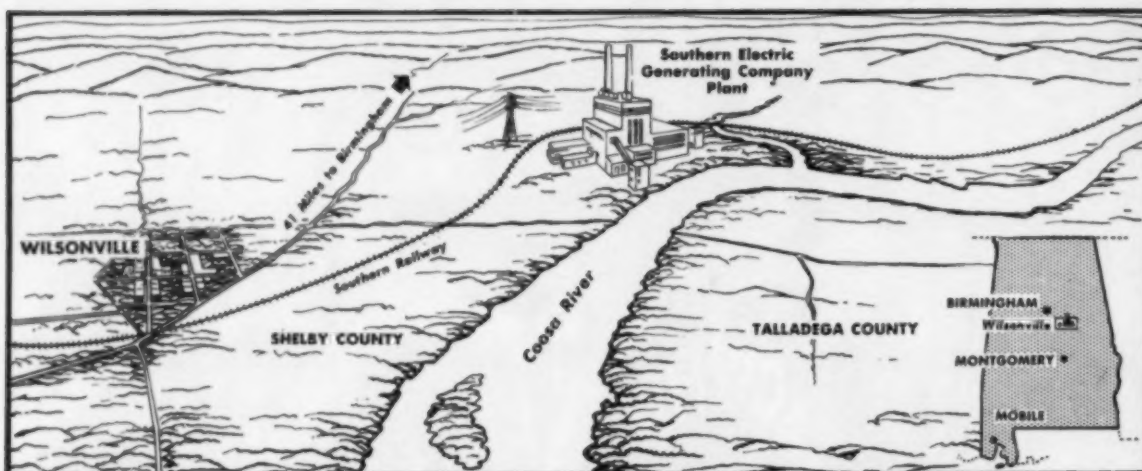
Don't guess at the correct rope for your machine, get a Macwhyte recommendation. Catalog G-16 available on request.

MACWHYTE COMPANY

2906 Fourteenth Avenue, Kenosha, Wisconsin

Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope, and Wire Rope Assemblies. Special catalogs available.

MILL DEPOTS: New York 4, 35 Water St. • Pittsburgh 36, 353 Old Curry Hollow Road • Detroit 3, 75 Oakman Blvd. • Chicago 6, 228 S. Desplaines St. • St. Paul 14, 2356 Hampden Ave. • Ft. Worth 1, P.O. Box 605 • Portland 9, 1603 N.W. 14th Ave. • Seattle 4, 87 Holgate St. • San Francisco 7, 188 King St. • Los Angeles 21, 2035 Sacramento St.



MILLION-KW POWER PLANT will rise Coosa River site in Alabama. Coal consumption will be 2-3 million tons a year.

Power Co., is expected to use between 2 and 3 million tons of coal a year.

The plant will rise on a site in Alabama's Shelby County, about two miles northeast of Wilsonville (drawing).

The company has already acquired coal rights in the Cahaba and Warrior coal fields, and explorations in both are underway now. One or more coal mines may be opened, according to the company, and plans to open at least one in the Warrior field have already been made. When opened the mine will produce about 1½ million tons of the generating plant's annual coal requirements.

The new super plant will be one of the country's largest stations. Its estimated cost is \$150 million, and plans call for the installation of four 250,000-kw units for its initial power capability. The first unit is expected to begin operation in the summer of 1960.

The site near Wilsonville was chosen because of accessibility to coal reserves, adequate water for cooling, a suitable rock foundation to support massive structures, the nearness of rail and highway transportation, and an easy transmission distance to both the Alabama and Georgia power companies.

18 Win Holmes Awards; Kaiser Mine, 522 Cited

Eighteen men in the country's mineral industries were awarded Medals of Honor by the Joseph A. Holmes Safety Association last month for heroic action. The association also voted a special group medal and citation to miners at the Kaiser Steel Corp.'s Sunnyside mine, Utah, whose lives were in jeopardy continuously for more than 24 hr as they fought to save three men trapped in a cave in. The association also awarded 522 certificates of honor for exceptional safety records and outstanding success in safe supervision.

The individual medal winners:

Leonard L. Romesberg, Rockwood, Pa.
Eldridge R. Hanning, Oak Grove, Ohio;

Thomas Riley, Jr., Nelsonville, Ohio;
William Stephenson, Glouster, Ohio;
John Sroka, Colonia, N. J.;
Melvin J. Marshall, Huntington, Utah;
James I. Olson, Wellington, Utah;
Allen R. Cox, Hiawatha, Utah;
Ross J. Anderson, Castle Dale, Utah;
Roy D. Killen, Henlawson, W. Va.;
Earl C. Emerson, Tioga, N. Dak.
Joseph O. Montoya, Grand Valley, Colo.;

David M. Pembridge, Rifle, Colo.
Richard C. Yarnell, Bellefonte, Pa.;
Ralph McMurtrie, Bellefonte, Pa.;
Joseph Furlaro, Bellefonte, Pa.;
Wilford Cassidy, Bellefonte, Pa.;
Richard Davis, Bellefonte, Pa.

Moss No. 3 to Produce At 3 Million-Ton Rate

Clinchfield Coal Corp. is planning to produce 3 million tons of coal a year at its Moss No. 3 mine. The mine, situated approximately 10 mi northeast of Moss No. 2, Dante, Va., is under development now.

Already underway are projects to extend the N&W RR track 5 mi, and to erect a preparation plant. The railroad is scheduled for completion in 11 mo, the preparation plant in 14.

In addition Clinchfield is planning to drive a 1½-mi tunnel to reach southwest

Virginia's 14-ft Tiller seam. Clinchfield owns 300 million tons of high quality Tiller coal on the southeast quarter of its 300,000-acre property.

Special high capacity mobile mining machine designed by the Joy Mfg. Co. will be used to mine the thick seam. Loading machines will be able to fill 15-ton shuttle cars at a rate of 15 tpm. Special twin-boom roof-bolting machines also will be used. From the special equipment Clinchfield officials expect to produce an average of 1,200 tons per shift from each section. Present plans, in fact, call for an overall output of 40 tons per man.

At the preparation plant clean coal from the washing process will be a high quality, low sulphur product that will meet the needs of steel manufacturers.

NCA Seeks Formation Of Research Foundation

The National Coal Association has proposed the formation of a Coal Research Foundation. The organization would be patterned after the National Advisory Committee for Aeronautics and the National Science Foundation. The proposal has been presented to the House Coal Research Subcommittee for action. Under a formula suggested by the NCA the foundation would be operated by an advisory board composed of 15 members representing the Dept. of Interior, the Dept. of Commerce, educational institutions, bituminous coal and anthracite, management and labor, and mining machinery and equipment manufacturers. In addition a representative of private research institutions and a public member would round out the board's interests. The foundation, itself, would not conduct any research, but would have authority to issue grants, loans, and other forms of assistance. It would also act as a clearing house for information and research data. The recommendation submitted to the subcommittee was presented by Harry LaViers, chairman of NCA's committee on research, and president of the South-East Coal Co., Paintsville, Ky.

In This Section

72-Mi Pipeline	142
Million-Kw Plant	142
18 Win Holmes Awards	144
3-Million Ton Mine	144
Coal Research	144
Old Timers Awards	146
News Briefs	146
Foreign News	158
Personal Notes	168
Among the Manufacturers.	177



Four Ways to Save Money with CRD One-Use Bits

1. You drill faster with low-cost Le Roi-

Cleveland CRD one-use bits because they have a special offset gauge feature which permits the use of thinner wings, and a steeper reaming angle. Binding is greatly reduced, and ample clearance is provided for cuttings.

2. You have less drill-steel breakage

with Le Roi-Cleveland CRD one-use bits. The method of bit attachment eliminates threads on the drill rod. And since a drill rod is only as strong as the root diameter of its threads, the tapered, threadless CRD's give you a stronger, power-saving union, and longer drill-steel life. Other savings result from reduced handling and reconditioning costs.

3. You have less wear and tear, too.

Rifle bars, rifle nuts, and chucks

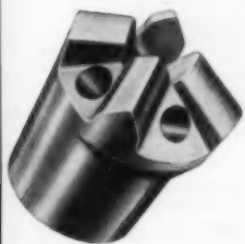
will last longer because CRD's are designed to reduce binding and ease strain on rotation parts of your drills.

4. They cost less, initially. CRD's cost

less than 25¢, half as much as comparable multiple-use bits. There's a big saving in time and labor spent handling bits, too. CRD's knock-off, throwaway use eliminates unscrewing, and all the time-consuming traffic between operator and bit shop.

It costs practically nothing to try them.

You don't need to invest in special threading or reconditioning equipment when you use Le Roi-Cleveland CRD one-use bits. Satisfy yourself that they can save you money. Get a can today, and start cutting your drilling costs right away.



LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

Old Timers Club Presents Student Awards

Harold K. Franklin, Sturgis, Ky., a senior in the University of Kentucky's College of Engineering, and Frederick W. Glowatsky, Ringtown, Pa., a senior at Lehigh University, were chosen recently as recipients of the Old Timers Club awards for scholastic achievement in mining engineering.

In Kentucky, Mr. Franklin was se-



KENTUCKY SENIOR Harold K. Franklin, Sturgis, Ky., accepts Old Timers award from Samuel M. Cassidy, vice president of Pittsburgh Consolidation Coal Co., at ceremonies in University of Kentucky's College of Engineering.

lected for scholastic achievement by the UK engineering faculty. A gold watch award was presented to him by Samuel M. Cassidy, an alumnus of the University of Kentucky and vice president of the Pittsburgh Consolidation Coal Co. Mr. Franklin, whose father is a mine foreman, at one time worked for the Poplar Ridge Coal Co.

In Pennsylvania, Mr. Glowatsky was

awarded a gold engraved watch by E. R. Price, a member of the U. S. Coal Mine Safety Board, during a meeting on the Lehigh campus. The award is given as a memorial to the men who have left the ranks of the Old Timers Club. It is also given to create and stimulate interest in the fields of mining, preparation, and utilization.



TOP SCHOLAR Frederick W. Glowatsky, Ringtown, Pa., accepts Old Timers Club award for scholastic attainment in mining engineering at Lehigh University. E. R. Price, U. S. Coal Mine Safety Board member, presented gold watch prize.

News Briefs

U. S. Steel's Frick District Palmer mine, opened in 1908, is being closed June 28.

The mine, which produced 16 million tons of metallurgical coal since being developed, has been exhausted of mineable coal, according to U. S. Steel. The H. C. Frick Coke Co. developed the

1,800-acre tract first. In 1918 the Palmer Dock & Harbor was constructed on the Monongahela River and the then active group of inland mines consisting of Ralph, Filbert, Buffington, Footedale, and Lambert, were connected with the Palmer mine. Their combined output was transported via underground rails to the Palmer Dock for barge shipment to the Clairton Works.

Republic Steel Corp. closed its Crescent No. 3 mine in Fallowfield Township, Washington County, Pa.

The shutdown was effective May 14. A total of 87 men will be idled by the closure.

Koal Krudes, Inc., completed a \$200,000 plant at Red Lodge, Mont., that produces char from sub-bituminous coal.

The plant will turn out char at a rate of 150 tpd, using a new medium-temperature coal carbonization process. The char is said to be particularly suitable for use in refining non-ferrous metals.

The Aluminum Co. of America bought the coal reserves of the Seneca Coal Co.'s Mine No. 2 near Sturgis, Ky.

Alcoa also has taken options to purchase 10,000 acres of additional coal lands near Sturgis. The reserves are needed as a source of supply for Alcoa's coal-fired steam power plant and new aluminum smelter in Warrick County, Ind.

The Westmoreland Coal Co. is planning to spend \$10 million to develop an underground mine 12 mi from Clothier, W. Va.

The mine will be situated on the Spring Laurel Fork of the Spruce River. Westmoreland expects to produce 5,000 to 6,000 tpd for 35 yr. Construction of preparatory facilities has already begun, but a number of major projects are still in the planning stage. Before production begins Westmoreland will change the course of the Spring Laurel Fork; lay 25,000 ft of track; cut through 900 ft of rock to the coal seam; construct a preparation plant; and construct a shaft.

Preparation Facilities

Pocahontas Fuel Co., Crane Creek plant, McComas, W. Va.—Contract closed with the Deister Concentrator Co. for two Concenco "77" diagonal deck coal washing tables.

Jamison Coal & Coke Co., Loveridge Mine, Fairview, W. Va.—Contract closed with the Deister Concentrator Co. for one Concenco "77" diagonal deck coal washing table.

Tunnel Ridge Coal Co., Auburn, Schuylkill County, Pa.—Contract closed with the Deister Concentrator Co. for five SuperDuty diagonal deck No. 7 coal washing tables for cleaning No. 4 buck size anthracite. In addition, con-

tract closed for one Concenco revolving feed distributor, Model 109, 10-way split for distribution to the No. 7 tables.

Jamison Coal & Coke Co., Loveridge Mine, Fairview, W. Va.—Contract closed with the Deister Concentrator Co. for two Concenco revolving feed distributors, Model 108, for feed distribution to "77" diagonal deck coal washing tables.

Imperial Smokeless Coal Co., Quinwood, W. Va.—Contract closed with the Kanawha Mfg. Co. for a coal and rock dust collecting system consisting of two Roto-clones and necessary duct work

for installation at the company's No. 2 mine, Carl, W. Va. Completion expected in September, 1957.

Consolidation Coal Co. (W. Va.), Mine No. 93, Byrne, W. Va.—Contract closed with the Industrial Engineering & Construction Co., for a raw coal storage and blending plant. The contract includes two 36-in belt conveyors to deliver 5x0 raw coal to two 1,000-ton Monolithic concrete storage bins. Blending from these bins is done by four Syntrol electric vibrating feeders, from which a 42-in conveyor will convey the coal to the present washing plant. Rate of flow, 550 tph. Probable completion date, the fourth quarter, 1957.



TRACKWORK IN DRESS REHEARSAL. Here is a three-way switch in the making, on the layout floors of our Johnstown, Pa., plant. The complete job is being preassembled at our plant in order to assure a perfect fit at the final site. So it is with all Bethlehem special trackwork projects. Thorough study of the customer's needs, skillful fabrication of the various parts and careful check on every detail inevitably results in efficient track that soon pays for itself. A Bethlehem engineer would like to discuss this with you, at your convenience.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation, Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



The company is planning to work the seam with four continuous miners. A small amount of coal is expected to be worked by next spring.

U. S. Steel announced it is developing an underground mine at New Eagle, Pa., about 20 mi south of Pittsburgh.

The mine will be named Maple Creek and is expected to attain a production tonnage of 500,000 tons a year by 1959. The coal will be used at U. S. Steel's coke plant at the Clairton Works, 8 mi down the Monongahela River. The company said that construction work on surface and underground facilities will begin in the fall of 1957. Plans call for installing a personnel service shaft, a refuse shaft, harbor facilities for barge loading, surface shop installations, and a rock slope for handling supplies and equipment. The mine is said to be the first step in developing a reserve area of 15,000 acres of Pittsburgh seam coal.

One of Alberta's largest mines, Greenhill, is being closed by its owner, West Canadian Collieries.

Company spokesman said the operation is being suspended because of the locomotive switch from steam to diesel by the Canadian Pacific Railway.

Island Creek Coal Co. president Raymond E. Salvati predicts that coal production will climb to 515 to 520 million tons this year.

Mr. Salvati disclosed the estimate

during a speech in New York. He said that at least two markets would demand more coal this year—South America, which will probably import 4 million tons of U.S. coal against 2 million last year, and Europe, which imported approximately 41 million tons last year. He noted, too, that power requirements of the nation are rising at a rate of 5 to 7% per year.

Appalachian Coals, Inc., in a May report announced that bituminous coal was exported through eastern ports at an annual rate of 62.3 million tons.

The report covered the period of 8 wk from February 24 through April 20. The increase in tidewater exports over totals registered a year ago and during the same period was 53.8%, reports ACI. The overall result—for the calendar year to May tidewater exports were running more than one-third higher than the record year of 1956.

The West Kentucky Coal Co., Madisonville, Ky., disclosed last month it will spend \$17 million to develop two new mines.

One of the mines, a deep and strip mine operation, is situated near Providence, Hopkins County, Ky. West Kentucky will spend \$6,360,000 on the operation, and expects to produce 1½ million tons of coal a year. The other mine is situated on the Ohio River 3 mi upstream from West Kentucky's Uniontown mine. The company plans to spend more

Bituminous Output

YEAR TO DATE PRODUCTION

May 18, 1957 193,494,000

May 19, 1956 198,242,000

1957 output 2.4% behind 1956.

A month earlier output was 3.3% below 1956.

WEEK ENDING PRODUCTION

May 18, 1957 9,640,000

May 19, 1956 9,649,000

Anthracite Output

YEAR TO DATE PRODUCTION

May 18, 1957 9,872,000

May 19, 1956 10,539,000

1957 output 6.3% behind 1956.

A month earlier 1957 output was 16% behind 1956.

WEEK ENDING PRODUCTION

May 18, 1957 509,000

May 19, 1956 420,000

than \$10.7 million on development. The disclosure to develop the mines was made by, Cyrus S. Eaton, chairman of the West Kentucky board, and by Mark Eastin, Jr., president.

The Lehigh Valley Coal Co. acquired most of the outstanding stock of the Steadley Co., Carthage, Mo.

Steadley is a manufacturer of bedding springs and furniture, and is valued at \$2 million. The acquisition marks the first move by Lehigh Valley Coal outside the anthracite field. Details of the transaction were not released but Lehigh Valley said the trade had been for cash.

American Coal Shipping, Inc., was reportedly considering entering the Great Lakes.

The report is unconfirmed, but a spokesman is said to have viewed the idea as a "legitimate prospect." At the time ACS applied to the U. S. Maritime Commission to charter 30 Liberty ships the company indicated that in the future it would consider expanding operations to the Great Lakes. At present ACS is carrying coal to West Germany, France, Spain, and Italy. Under its charter ACS is permitted to transport coal outbound, iron ore inbound.

Pennsylvania's Luzerne Electric Div., United Gas Improvement Co., is more than doubling the output of its anthracite-fired Hunlock Creek, Pa., generating plant.

The company embarked on a \$10 million spending program designed to bring 44,000 kw more to its generating facility by 1960. Approximately 500 tpd of anthracite will be burned. The plant was erected in 1925.



BCR AWARD WINNERS Michael Perch (left) and Charles C. Russell, Koppers Co., examine coke for cupola tests described in winning paper read at American chemical Society. Study of factors governing foundry coke solution rate in molten iron showed that coke ash content inhibited carbon solubility.

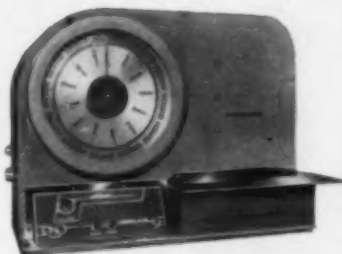
Model CDO

instrument translates electronic weight message for direct transmission to automatic typewriter or adding machine.



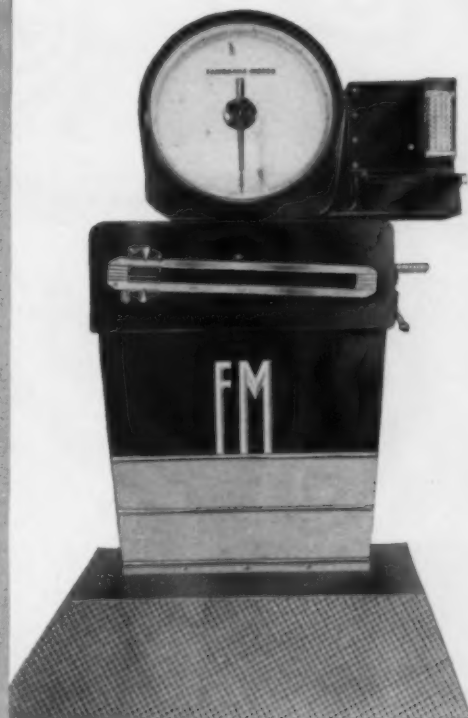
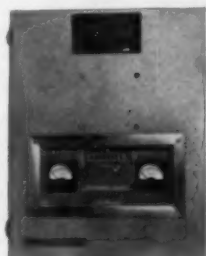
Model CR

desk indicator and weight printer can be located up to 250 feet from any Fairbanks-Morse electronic motor truck or track scale.



Remote reading

instrument for belt conveyor scale shows tonnage accumulated, percent capacity load and tons per hour.



The Fairbanks-Morse Floaxial

dial (with or without printer) is applicable to all mechanical F-M motor truck, track, mine car or weigh hopper scales.

However you weigh it

The Fairbanks-Morse way is the fast, convenient, accurate and economical method of measuring coal tonnage in production or distribution. There are Fairbanks-Morse electronic and mechanical scales for every coal weighing operation—and Fairbanks-Morse electronic scales for your belt conveyors.

The Fairbanks-Morse electronic systems offer the advantage of remote indication up to 250 feet—and they will feed the weight in-

formation directly into business machines like automatic typewriters, automatic adders or motorized tape punches. It is probable that your present lever scales can be converted to semi-electronic operation—for remote reading, recording

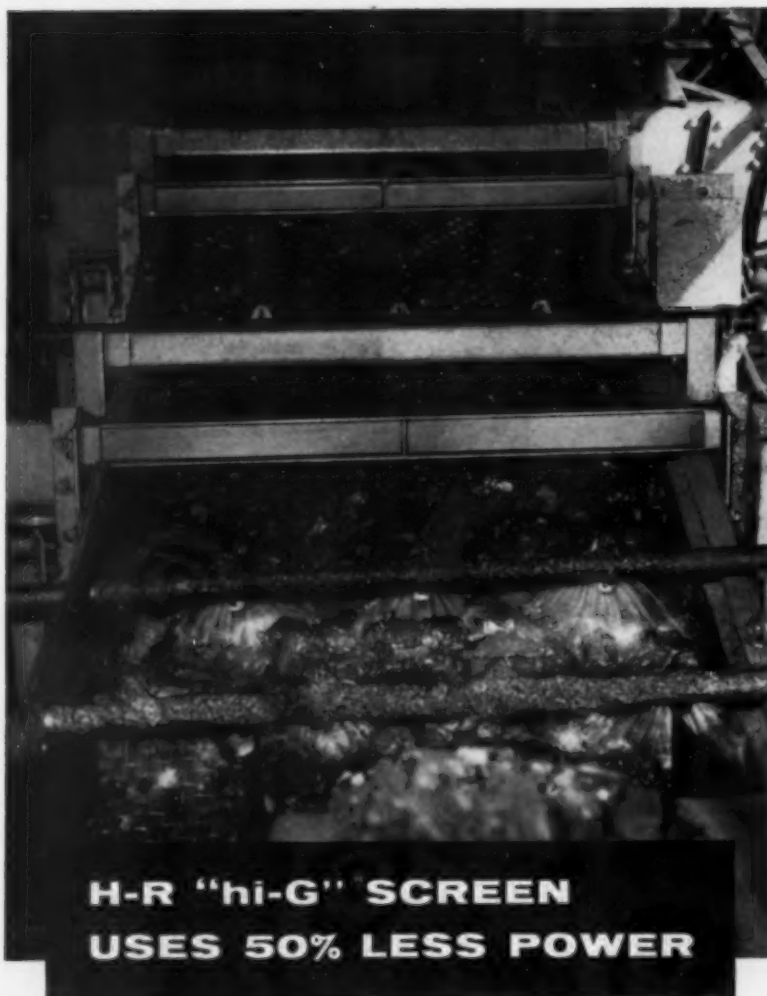
and readout through Fairbanks-Morse electronic instrumentation. Write for informative new bulletin No. ED-16, or see your F-M scale expert. Fairbanks, Morse & Co., Dept. CA-6, 600 South Michigan Avenue, Chicago 5, Illinois.



FAIRBANKS-MORSE

a name worth remembering when you want the BEST

SCALES • PUMPS • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS



**H-R "hi-G" SCREEN
USES 50% LESS POWER**

To reclaim coal from a 4-million ton waste pile, Black Star Anthracite Coal Company of Hazleton, Pa., uses a Hewitt-Robins bulk materials handling system which processes about 200 tons of material per hour. Coal is reclaimed, washed, sized, and recovered at the rate of 20 tons per hour.

An important unit in the system is Hewitt-Robins' "hi-G" Vibrating Screen, which operates on 50% less power. Savings up to \$500 per year are realized with 6 x 28 ft. sizes. Readily accessible lower deck permits clear observation, easy spray pipe installation, and quick cloth changes.

To find out how H-R products and services can help you, consult your classified telephone directory for the nearest H-R representative, or contact Hewitt-Robins, Stamford, Conn.



HEWITT-ROBINS

CONVEYOR BELTING AND IDLERS... POWER TRANSMISSION DRIVES
INDUSTRIAL HOSE... VIBRATING CONVEYORS, SCREENS & SHAKEOUTS

AMC Report (from p 100)

So far, only the snap-back timing method has been used, but the continuous method may have some advantage in recording where the snap-back has some advantage in work-up.

In analyzing a study for possible savings in time and human effort, a check list of questions is used. Typical questions are:

1. Are the fewest possible movements used to accomplish this task?
2. Are tools in the most accessible place?

3. Are tools in proper condition?

4. Are controls in the best location?

5. Is the right man doing the job, etc?

Mr. Lockin pointed out that method studies are very helpful in selling the need for change. "Their major value can be in this one advantage alone.

We all know the difficulty in changing people's way of doing things. Before they will willingly change their work habits, they have to be sold on the advantages of any change."

**Cleaning
Anthracite Fines**

"The Jeddo No. 7 fine-coal plant is compact, having all machinery housed in a 32x63x-28-ft building. There is ample room for maintenance and the plant is operated by one man."

The new fine-coal cleaning plant of the Jeddo-Highland Coal Co., Jeddo, Pa., as described by E. M. Robinson, Jeddo-Highland's superintendent of preparation, recovers marketable Buckwheat No. 5 ($\frac{3}{64}$ in x 100 mesh) from the effluent stream of the main preparation plant. The effluent is carried to the new plant through 150 ft of 18-in terra cotta pipe. Plus $\frac{3}{64}$ -in material is scalped on a pair of launder screens, dewatered on a vibrating screen and cleaned in a Wilnot Hydrotator. The underflow of the top launders is passed over another pair of launder screens to drop out minus 100-mesh material which is high in ash and undesirable in the product.

Overflow of the bottom launders is collected in a settling tank and removed by the bottom conveyor to feed a 12-ft Wilnot froth classifier. The classifier has a feed capacity of 50 tph and produces 30 tph of clean coal. The froth product flows to a collecting sump with the underflow of the clean coal vibrating screens, the overflow of the Hydrotator sump and 100 gpm of fresh water, Mr. Robinson explained. The mixture in the collecting sump is pumped at a rate of 460 gpm by a 5-in Barrett-Haentjens pump to a battery of 8-in Wilnot cyclones at a pressure of 30 psi.

Cyclone overflow is wasted. However, if this reject is low in ash or if additional water is needed in the plant, the cyclone overflow may be returned to the froth classifier. The cyclone product is dewatered on vibrators and blended for



KEEP PRODUCTION ROLLING *with help like this . . .*

- **EXCLUSIVE "ROLL-AWAY" MOLDBOARD . . .** moves tough dirt fast
- **NEW TOGGLE-TYPE CONTROL . . .** kick-free in the rough . . . pinpoint accuracy
- **HIGHEST AXLE AND THROAT CLEARANCE in its class . . .** for better handling of biggest loads
- **TOUGH TUBULAR FRAME . . .** shock-absorbing strength down the middle
- **BOX-SEAT COMFORT AND VISIBILITY . . .** satisfied operators . . . more and better work done on all grading jobs

ROLL-AWAY is an Allis-Chalmers trademark

These are five of many reasons why Allis-Chalmers FORTY FIVE motor graders are showing up in more and more mining and quarrying operations. They are precisely what the dirt-moving specialists ordered . . . ready now to handle haul road construction and maintenance easily, smoothly. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

Engineering in Action

If you
convey
this ...

you
need
this ...



QUAKER CONVEYOR BELTING FOR SAFETY AND STAMINA!

Quaker Rubber's fire-resistant, flame-retarding belt actually *exceeds* the U. S. Bureau of Mines essential standards for underground mine safety.

The specified flame test permits burning up to 1 minute. But when the test is made on Quaker's belt, the flame is extinguished *instantly*. What's more, afterglow disappears in about one-third the time required by Bureau standards.

This belt is also lightweight and highly flexible. It has good troughability, yet is tough enough to take shock impacts

and heavy, jagged loads. Made in any length. Widths up to 72".

Next time, specify "Fire Resistant U.S.B.M. 28-11" from your Quaker Rubber or Quaker Pioneer Rubber distributor. You'll like the savings ... and the service.

For more information, write to:
H. K. Porter Company, Inc.,
Quaker Rubber Division,
Philadelphia 24, Pennsylvania, or
Quaker Pioneer Rubber Division,
Pittsburg, California.

HKP QUAKER RUBBER DIVISION
QUAKER PIONEER RUBBER DIVISION
H. K. PORTER COMPANY, INC.

AMC Report (Continued)

loading into railroad cars with the other fine-coat products.

Plant costs reported by Mr. Robinson are as follows:

Operation:

Labor	....	\$0.235
Power	....	0.093
Fuel Oil	....	0.015
Pine Oil	....	0.167
		<u>\$0.510</u>

Maintenance:

Labor	....	\$0.280
Material	....	0.219
		<u>0.499</u>
		<u>\$1.009</u>

Total connected load in the plant is 112½ hp.

Fine-Coal Equipment

"I feel I am justified in stating that we need have no sludge problem if we are willing to spend the money necessary to correct it."

If space is available for disposal of sludge, there is little doubt that it is cheaper to get more coal from the mine than it is to recover the coal from the waste water, said W. C. McCulloch, coal preparation manager, Roberts & Schaefer Co., Chicago, Ill., in a paper read by J. D. Wender, R&S research engineer. Such disposal is possible in flat country where it is relatively easy to impound an area for sludge accumulation, but a better approach is to process the slurry in the plant to avoid the accumulations. In some instances, legislation is gradually forcing improvement and it becomes necessary to recover the fines if only to add the product to the refuse.

With regard to equipment, Mr. McCulloch pointed out that in the category of simple reclamation there are many types of filters and thickeners. Units for fuller cleaning include froth flotation, Convertol, slime tabling and jigging. For complete recovery, gravity is the best tool in thickeners having sufficient area to provide clear-water overflow. Where colloidal fines prevent complete settlement flocculants must be added. Cyclones and solid-bowl centrifuges provide almost complete recovery in sizes down to 325 mesh. Where conditions are favorable it may be expected that extreme fines will be "painted" on coarser particles, resulting essentially in a closed circuit.

Following thickening, filtering in disk, top feed, horizontal or drum units makes the final cleanup.

Assuming that quality of the sludge and cost of treatment have been properly evaluated, Mr. McCulloch said, it may be desired to combine cleaning with total recovery of the products. In this instance the original flowsheet of the plant has direct bearing on the treatment required. Simple Baum-type jigging with controlled capacity ratings may suffice. Tabling with limited top

AMC Report (Continued)

size in the feed to resemble slime treatment may be all that is required. Feldspar jigs with natural material forming the false bed do an acceptable job, and the Hydrotator classifier not only deslimes but also recovers fine coal, cleaned and partially dewatered.

The cost of froth-flotation, assuming the plant is equipped with filtering and thickening equipment, is low. The addition of flotation equipment is a relatively minor project in a plant that is so equipped. The cost of reagents is negligible when compared with the benefits of the cleaner coal.

In air cleaning the sludge problem is eliminated, Mr. McCulloch said. The comparative results of wet and dry cleaning must be evaluated, but there are advantages in keeping the coal out of water. There is obviously no reason for replacing ash with moisture in the present market when so many contracts are based upon "as received" Btu values. Ordinary installations of air-cleaning equipment clean down to about 48 mesh. Below this size no improvement in ash is noted but the fine sizes are available for mixing with the clean coal on a 100% recovery basis, and the sludge problems inherent in wet washing are avoided.

Water Clarification

"We found we had underestimated the quantity of sliming material which would be produced, and found ourselves with a substantial load of recirculating solids."

This was the problem at Robena, as set forth by Paul L. Richards, manager—coal preparation, U. S. Steel Corp., Pittsburgh, in a paper co-authored by J. C. Durfee, superintendent of the Robena plant, at Greensboro, Pa. As this load of solids in circulation grew it became necessary to bleed off some of the slime-laden water into a spill pond of generous proportions. However, when plans were laid in 1951 for an increase in the capacity of the plant, it was decided to improve the water system by making changes in the original circuit. The new facilities included the addition of a second 180-ft thickener in which the overflow of the primary thickener could be flocculated. The flocculated underflow of the new thickener is pumped to Bird centrifuges for dewatering and this cake is included with coarse plant refuse.

In selecting a flocculating agent it was necessary to consider the possible effect on the heavy-media units in which the plus ¼-in coal is prepared. A build-up in the plant water of any reagent that would cause the magnetite to flocculate could not be tolerated, Mr. Richards explained. Starch with or without lime additions proved to be satisfactory. Lime additions were required, however, to insure entirely clear flocculator over-

(Continued on p 182)



Safe!

with

West Virginia Mine Roof Bolts

You save time, labor costs and production delays, without compromise in safety and security, with fully assembled or Cone-Neck West Virginia roof bolts.

Engineered for greater gripping surface and extra large expansion, West Virginia expansion units anchor securely and are easy to insert. The bolts are manufactured from West Virginia's own closely controlled electric furnace steel for uniform high quality. Shipped to meet your schedule requirements.

Hold up the Roof...

Not Production!

specify

West Virginia Mine Roof Bolts

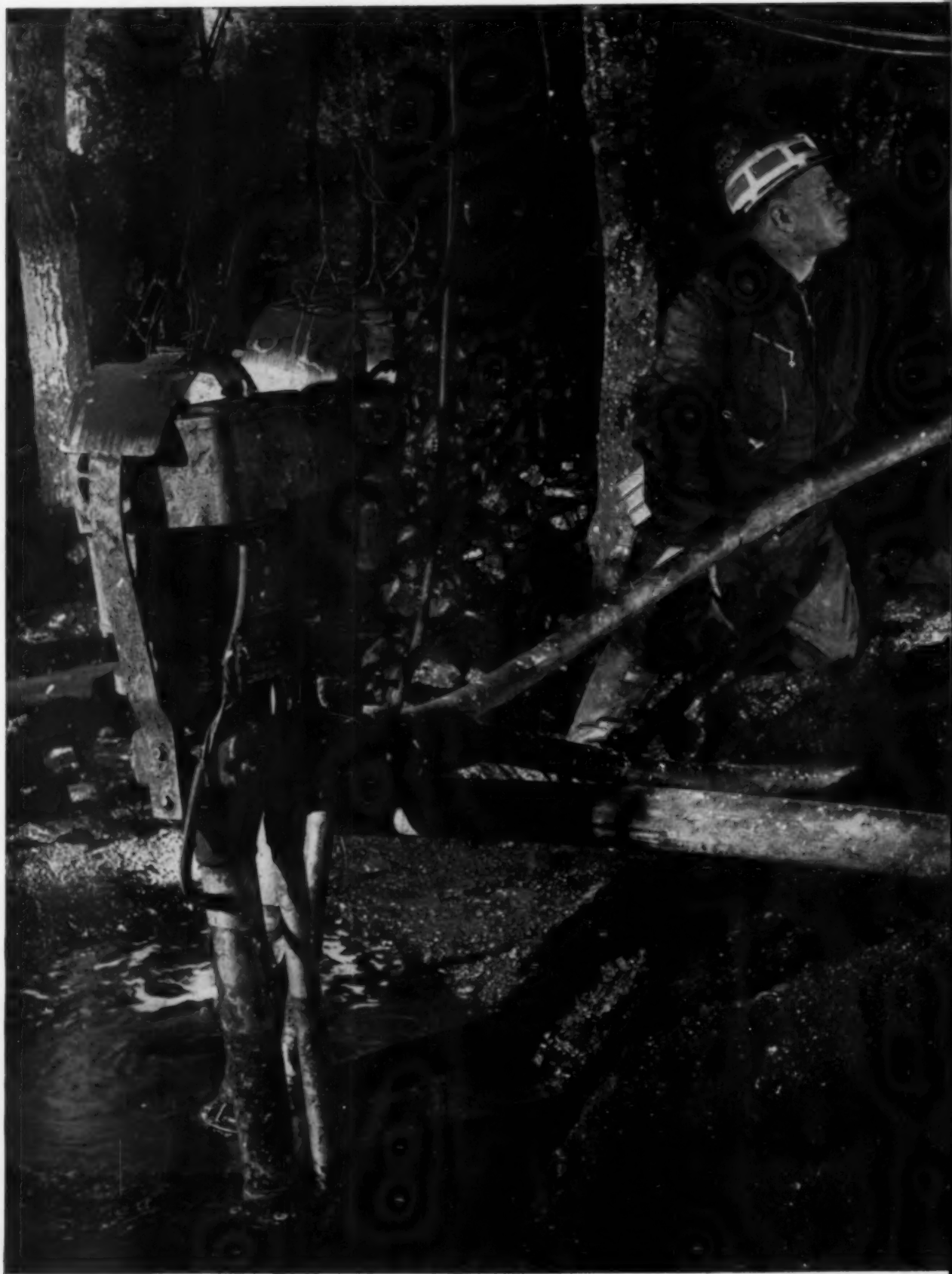
For experienced Engineering Service and personalized attention to your needs, call, wire or write West Virginia Works, Connors Steel Division, H. K. Porter Company, Huntington, West Virginia.



HKP

CONNORS STEEL DIVISION

H. K. PORTER COMPANY, INC.



"Westinghouse-pump motors work 5,830 continuous hours with no breakdown"

At Jamison Coal & Coke Company's Mine No. 21

The work face of Jamison Mine No. 21 at Hostetter, Pa., would be flooded if it were not for dependable Barrett-Haentjens sump pumps. The motor-driven "Hazleton" portable pumps shown here have been discharging highly acidic mine water 24 hours a day, 7 days a week, for over eight months. Other Westinghouse-powered pumps at the mine have operated continuously for as long as two solid years.

Westinghouse is constantly working with leading mine equipment builders like Barrett, Haentjens

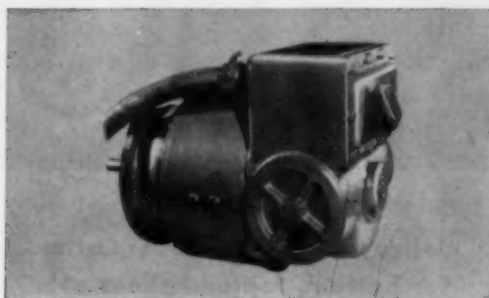
& Company to provide the industry's most reliable electrical equipment. For example, a new $\frac{3}{4}$ -hp, 550-volt, d-c explosion-proof motor will be in production soon to meet the growing trend toward higher voltage distribution systems in modern mines.

Get all the facts about Westinghouse mining motors, both standard and special, by calling your Westinghouse sales engineer today. Or, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-22031

YOU CAN BE SURE...IF IT'S **Westinghouse**



Loading machines operating at the face in Jamison Coal & Coke Company's Mine No. 21. Westinghouse also builds explosion-proof motors for this application, and for all kinds of tough mining jobs.



This compact combination motor and control unit is ideally suited for use on portable and semiportable mine auxiliary equipment where small motor pumps, rock dusters, etc., are required.

push your coal production UP

with this hard-working JEFFREY team



**Jeffrey 70-UR Universal Cutter
for bottom, top and shear cuts**

Head and cutter can be rotated 360° in either direction and positioned to make any kind of cut, any place in the seam. From one location, the 70-UR Cutter makes a 30-foot horizontal cut (using a 9-foot cutter bar) or a shearing cut 5' 5" to either side of the machine's centerline. No

wonder mine superintendents brag about its tonnage-producing ability!

Operators report smooth and positive traction for sumping, even when cutting at extreme range. The 70-UR's wide wheel gauge, long wheel base, low center of gravity and large pneumatic tires give sure-footed stability. Maintenance men say that its rugged construction reduces downtime and cuts upkeep costs.

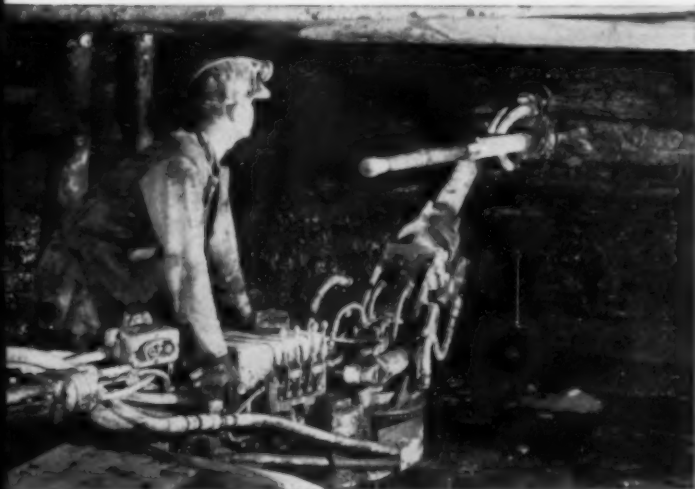


Jeffrey 81-A Loader for high capacity loading

From both a production and a maintenance standpoint, the 81-A Loader is a superior machine. It is well balanced and flexible, and is easily maneuvered; trams at 137 FPM and can be turned in its own length. The conveyor swings 45° either side of center and elevates

properly to load shuttle cars on the straight and in break-throughs. It has a rated capacity of 8 TPM and a maximum capacity of 10 TPM.

Maintenance is simplified on the Jeffrey 81-A Loader because every motor and gear case is a separate, detachable unit. This kind of unit construction is used throughout, resulting in rapid replacements and lower upkeep costs.



Jeffrey 56-FHR Face Drill for shot hole drilling

This single-boom drill provides a high degree of operating flexibility. It is rubber-tire-mounted and self-propelled by two hydraulic motors. Another operates the cable reel. The drilling head can be swung by finger-tip control to any desired position for shot hole placement. Drilling range is 7' 2 5/8" vertically and 13' 1 3/4" horizontally.

Jeffrey 56-RDR Roof Drill

Big, sturdy, easy to maneuver and fast drilling. 10' 9 1/2" arm swing permits a wide room to be bolted from one position. Hydraulic torque wrench assures accurate bolt tightening.

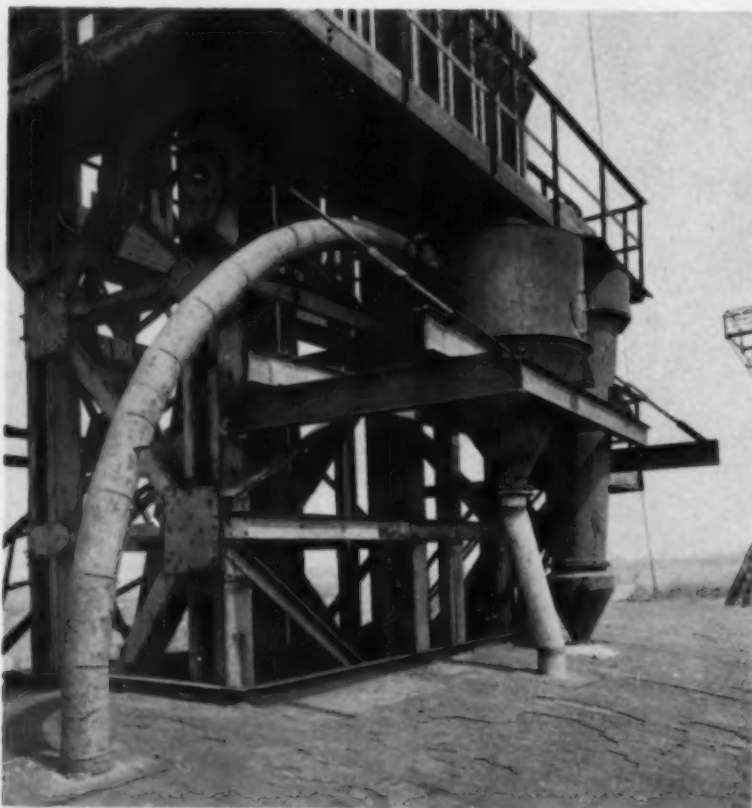
OTHER JEFFREY EQUIPMENT FOR UNDERGROUND SERVICE:

Continuous Mining Machines • Conveyors • Shuttle Cars • Locomotives • Fans and Blowers
Descriptive literature sent upon request. The Jeffrey Manufacturing Co., Columbus 16, Ohio



MINING • CONVEYING • PROCESSING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

Foreign News



CYCLONES separate coal, air on roof of West Germany's Vondern Colliery where pneumatic conveying experiments were carried out.

WEST GERMANY

Promising results were obtained recently during experiments in conveying coal pneumatically up a shaft 300 yd

deep at the Vondern Colliery, Oberhausen.

The results indicated that vertical pneumatic conveying can increase the conveying capacity of shafts with only

little additional investment and that costs will be lower than costs for hoisting.

The only disadvantage that turned up was that conveyed coal had to be limited in size to less than 1 in. As a result, the coal was either screened or crushed before it was conveyed. During the conveying, itself, the coal was broken up further. The end product, thus, on a production scale, would be profitable only where there is a demand for relatively fine coal.

The experiments were conducted with an 8-in compressed-air pipe. Coal was forced into it by a pressure conveyor equipped with a worm distributor. At the surface coal and air were separated and the coal stored in a surface bunker. The air was returned underground where it passed through a filter-equipped bunker. The underground bunker was connected with the pressure conveyor completing the cycle and maintaining a closed circuit.

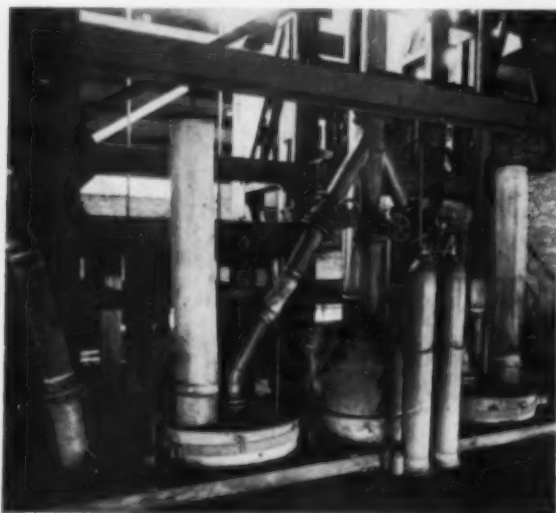
During the experiments 50 tph were conveyed. Air consumption was 91.56 cu yd per ton, pressure was 46.31 lb per sq in.

To investigate the use of pneumatic conveying for other depths the velocities of individual coal particles of different sizes were measured by coating the particles with radioactive material.

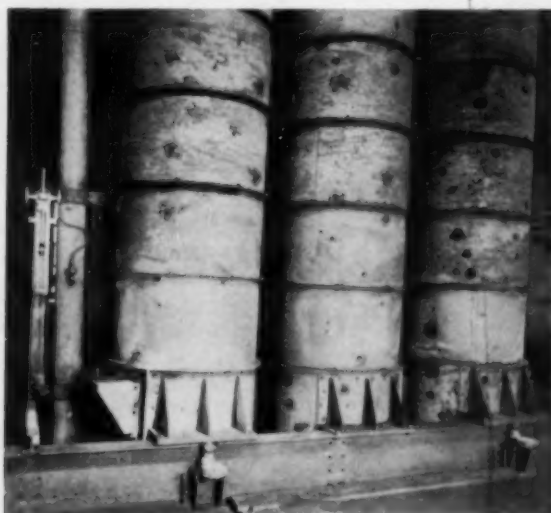
The results of the velocity studies showed that air consumption increased 2 to 2½ times when the conveying distance was increased to 800 meters. In addition, the tests showed that to achieve the 50-tph output under the same pressure conditions, pipe diameter would have to be 2 to 2½ times the size of the experimental pipe.

The investment cost of the 300-yd pipe, itself, was \$76,000. The shaft and surface bunker costs were not considered during cost evaluations, since the Vondern Colliery already was equipped with them. And, since screening would be required, anyway, the cost of this, too, was not calculated.

Thus, the experimenters concluded



SURFACE BUNKER, beneath cyclones. Gas bottles contain nitrogen for emergencies.



WEIGHING BUNKER is equipped with pressure standardizing boxes. Air-coal mixture is unfavorable for explosion.



Roof Bolting at the Face Minimizes Danger of Rock Falls

When you install Bethlehem headed roof bolts at the face, using a pre-determined pattern, the mine roof becomes safer, less likely to fall. This is because the roof bolts lock themselves in drilled holes, anchoring the strata into a thick, self-supporting beam.

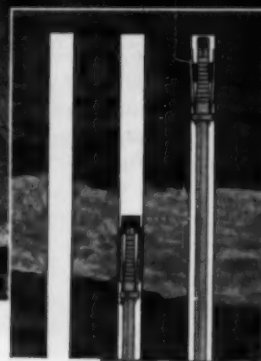
With such a roof bolting installation, wider openings and clearances are possible. And because there are no bulky supports, mechanized equipment can be maneuvered easily, even right up to the face. Besides, there's no fire hazard involved.

CHOOSE FROM THREE TYPES

The Bethlehem headed roof bolt is furnished in these types:

1. $\frac{3}{4}$ -in. carbon steel; typical breaking load 24,000 lb.
2. $\frac{5}{8}$ -in. high-strength; typical breaking load 24,000 lb.
3. $\frac{7}{8}$ -in. high-strength; typical breaking load 45,000 lb.

If you would like to have additional information about the use of Bethlehem headed roof bolts, or the 1-in., wedge-type slotted roof bolt, all you need do is drop a line to the nearest Bethlehem sales office.



HOW TO INSTALL

Assembly, consisting of square-head bolt, square roof plate, malleable-iron shell and steel plug, is inserted in drilled hole.

Bolt is tightened, drawing down plug, and expanding leaves of shell.

Roof plate provides additional support. Steel tie may be used instead.

BETHLEHEM STEEL COMPANY BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation. Export
Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

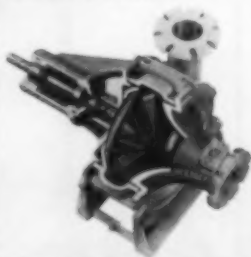


**Could this have
been pumped by
anything but a
LIQUID IMPELLER?**

It was dented, and somewhat the worse for wear, but nevertheless still recognizable as an auto muffler. The question: how did it get into the re-pulp stock line from the hydropulper?

The answer is simple. The muffler, twelve inches long, was pumped out of the hydropulper through an eight-inch Wemco torque-flow Solids Pump.

This is an actual case history, typical of many about this amazing pump and its "can't clog" liquid impeller action. Interested? Just ask for the facts.

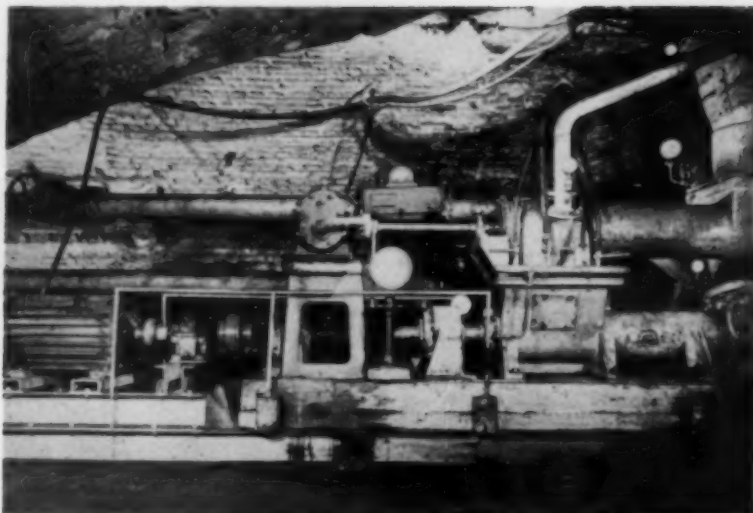


WEMCO
TORQUE-FLOW
SOLIDS
PUMP

**WESTERN
MACHINERY
COMPANY**

650 FIFTH STREET, SAN FRANCISCO 7, CALIF.

Foreign News (Continued)



PRESSURE CONVEYOR at mine bottom was changed for larger unit when coal-filled pockets plugged conveyor.

that under a 20-hr daily operation, 300,000 metric tons of coal could be pneumatically conveyed by two men per shift (three shifts per day) at a cost of 19c per ton, compared with a current hoisting cost of 57c per ton.

On the basis of the experiments at Vondern Collier, a Ruhr area mining company, which prefers to remain anonymous now, has begun constructing a pneumatic conveying installation to raise 50 tph. Johannes Moeller, Hamburg-Altona, is building the installation.

A patented method for fighting silicosis by spraying mine air with a concentrated lime solution mixed with a foam containing vegetable fat or albumen has been reported by the London publication, *Iron & Coal Trades Review*.

In an abstract of an anonymously-written article appearing in the German publication *Bergbau Rundschau*, *Iron & Coal Trades reports* (April 12, 1957, p 854) that the method is the result of experimenting for 6 yr among 600 iron miners in Germany's southern Westphalia.

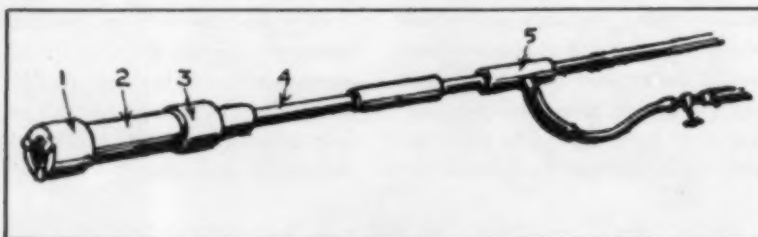
Under the authors' patented process lime salt, riding globules of albumen-filled mist, would be sprayed into the air of a mine, where the lime would unite with the already present silica

dust particles. The result would be particles increased to 0.01 mm diameter, a size which is said to be too large to be drawn into the lungs. If some particles do make their way to the lungs they will arrive there surrounded by lime, a condition that will prevent the formation of dissolved silica, which is the cause of silicosis. If any dissolved silica should appear it will be neutralized by the lime.

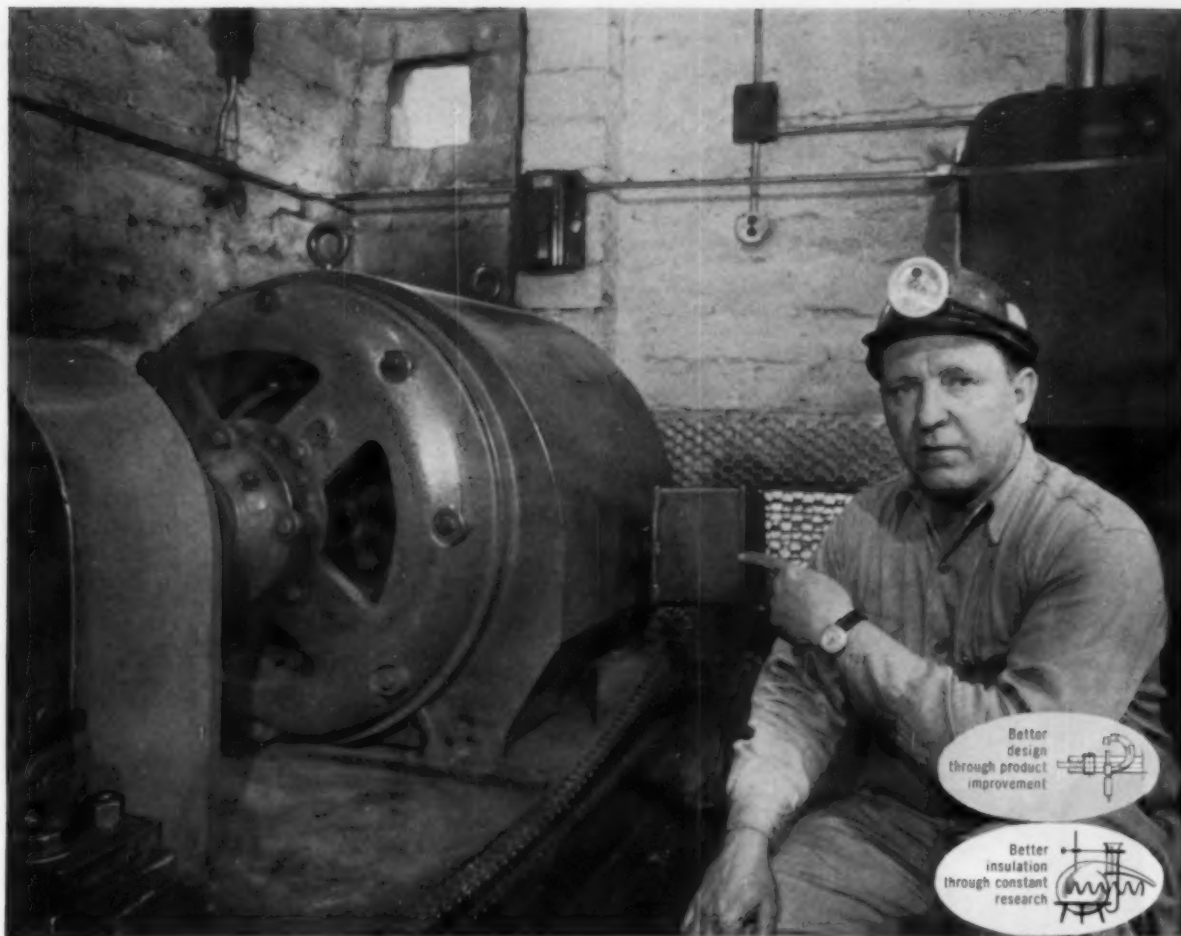
A German steel industry executive says German metallurgical plants will increase coal imports from America by 1 million tons this year. Dr. Hermann Winkhaus, member of the board of directors, of Mannesmann AG, Duesseldorf, said that contrary to general opinion there is still 15 million tons a year in German coal mines which cannot be exploited because of a shortage of miners. It is estimated that the 15 million tons which approximately equal the imports from America, could be mined by 25,000 miners.

USSR

The Soviets are using a new rotary percussion drill that drills horizontal lengths up to 164 ft with no deviations.



REDESIGNED SOVIET DRILL has 1) cylindrical hollow drill bit; 2) cylinder to which the drill bit is attached; 3) flange connecting cylinder and drill rod; 4) half-rod; 5) water inlet connected to pump.



Better design
through product
improvement

Better
insulation
through constant
research



These motors mean life for 156 men underground

**Louis Allis motors provide unfailing drives for mine fans
exhausting explosive and poisonous gases**

Here's a performance record that's hard to beat — not a single mine shutdown due to exhaust-fan power failure since the installation of two Louis Allis 200-hp motors in 1951.

"These motors have been operating day-in, day-out on a round-the-clock basis — without failure, breakdown, or maintenance — for the past six years," reports the mine superintendent of a prominent West Virginia coal mine.

That's pay-off performance where it's really needed. Even a short interruption in service might permit the formation of poisonous or explosive gas pockets. At best this would mean shutting down the mine, a

safety test, and a complete recycle of fresh air before the men could re-enter. This recycle period incurs a production loss that might equal \$1000.

Louis Allis drip-proof motors provide the same reliable, trouble-free service regardless of application. Louis Allis features include moisture- and corrosion-resistant cast-iron housings and special varnishes, rigid end brackets, and locked bearings. They are properly lubricated and ventilated for long life.

Investigate these and Louis Allis Bureau-of-Mines-permissible motors for underground installations. Contact your Louis Allis District Office or write The Louis Allis Co., 441 E. Stewart St., Milwaukee 1, Wis.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

Foreign News (Continued)

The unit is being used in a mine near the village of Kriwoj Rog, and is a redesigned version of a Russian standard drill, the KS-50. In redesigning the unit, engineer G. F. Bichovets strengthened the bit-carrying drill rod, suspending the rod to prevent it from touching the hole wall. The diamond studded bit used on the old KS-50 was replaced with a cylindrical hollow bit, which was equipped with a large number of small diameter water jets. The drill rod, or stem, was connected with conically-shaped ends, instead of the usual threaded rod connections. The result of the redesigning was to firmly anchor the drill rod's drive end.

FRANCE

Paris (McGraw-Hill World News)—A special study prepared by the Organization for European Economic Cooperation on what western Europe's economy will look like in 1960 assumes that European net coal imports in that year will amount to 40 million tons.

The estimate roughly equals the figure contained in OEEC's special energy report issued last June. At that time, the organization figured western Europe's coal imports would be about 44 million tons in 1960 and some 50-odd millions tons by 1975. Last year, coal imports into western Europe rose to some 40 million tons.

In the matter of investment in the coal

fields of western Europe, the new OEEC report estimates that over the next 5 yr investment requirements will run at an average rate of \$600 million per year, or some \$3 billion total. The report warns that despite the advent of nuclear energy, "It is clear that investment at this level in the coal mines is essential at the present time." The OEEC report adds that coal will continue to provide a large proportion of Europe's total energy supplies for many years to come. In particular, the report notes the rapidly rising demand for metallurgical coking coal.

Investment requirements will, of course, vary from country to country. The OEEC report fixes the average annual capital expenditure per ton of output over 1953-55 for France at \$1.50; for Belgium, \$1.20; for the Netherlands, \$0.90, for the United Kingdom, \$0.80 and for Germany, \$0.70. Most countries will hike this rate with the exception of France, where large programs set up after the war have now been completed and where productivity is nearly 25% over prewar levels.

POLAND

Three new Polish coal deposits containing 1,000 million metric tons, according to official Polish estimates, will begin producing as "soon as possible," the government has announced. The Poles are seeking an annual production level from the new deposits of 30 million tons. The coal, said to be of coking quality, will be mined by the "Mszana," the "Jastrzebie," and the "Mosozenica" mines, three operations which constitute Poland's ROP, or Rybnik Industrial Center. Plans are underway, now, to develop ROP into a second Polish coal pool area, matching the long-producing Upper Silesian district. The only brake that might hold back ROP development and mining the new deposits is financing.

In Geneva, late in March, Poland announced she was seeking foreign loans to finance exploitation of vast coal and lignite reserve tracts for export to European countries now buying from the dollar area—or the United States. Exports of Polish coal dropped from more than 24 million tons in 1955 to 19.4 million tons in 1957. Although Polish coal output rose from 66 million tons in 1938 to 95 million tons in 1956, the increased production has been unable to keep pace with growing domestic demand. A rapid increase in production can not be possible without "an important contribution of foreign funds," says one official.

GREAT BRITAIN

The National Coal Board has bought its first industrial television unit for use at the Manvers coal preparation plant at Wath-On-Deerne in Yorkshire, England. The plant, one of the largest in Europe, processes the entire output of four collieries. The new installation is being used to view a coal input conveyor system where several conveyor belts converge.

Parmanco

H-81-53

HORIZONTAL DRILL



Completely Re-designed

- with hydraulic feed
- horse power increased to 81 with "223" cubic inch engine

Included in the new design is a sturdier frame, with the elimination of racks, pinions, and all mechanical power feed gearing. The four individually adjustable jacks make possible faster set-up and smoother drilling.

Easily cuts drilling time IN HALF



The H-81-53 drill is designed for drilling 5-6-8 inch holes to 100 feet or more. The greatly increased 81 h.p. engine in combination with the hydraulic feed makes possible the reduction of footage time by at least one half. All drive gears are totally enclosed. Power feed features direct hydraulic feed eliminating reduction gearing in hydraulic feed system.

This new drill—the very latest in design—is equipped with self-starter and generator, dual type front wheels, truck type rear axle with hydraulic brakes, and traction drive with both

forward and reverse. Here is greater speed in retrieving augers and four rotating speeds and reverse for drilling and cleaning the hole. Here is accuracy and mobility. Here is the modern answer to faster, lower-cost drilling.

• SEND FOR COMPLETE DETAILS

PARIS MANUFACTURING CO. PARIS, ILLINOIS



coal processors all over America prefer **WISSCO-LOY® SPACE SCREENS**

If you haven't switched to Wissco-Loy Space Screens yet, you owe it to yourself—and your profit—to find out about them.

You'll find that Wissco-Loy Screens are tailor-made to your specific need, but are low in initial cost. And they give long service because every knuckle of the tough, special wire is carefully crimped to prevent "hidden wear" at the wire intersections.

Tailor-made . . . low in cost . . . long in service. Yet Wissco-Loy Space Screens give you even more. For Wickwire engineers are always available to help you solve your screening problems and to recommend the right screen for your job.

Get the complete story on all the advantages offered by Wissco-Loy Screens. Without obligation. Just contact your nearby CF&I representative today.

NEED STAINLESS STEEL SPACE CLOTH OR EXTRA-RUGGED SCREENS? Ask your CF&I representative about his complete line of stainless steel screens as well as extra-tough, oil-tempered Super-Tempered Precision Space Screens.



SPACE SCREENS

THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Casper • Denver • El Paso • Ft. Worth • Houston • Lincoln (Neb.) • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane • Wichita • WICKWIRE SPENCER STEEL DIVISION—Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York • Philadelphia

CF&I OFFICES IN CANADA: Montreal • Toronto
CANADIAN REPRESENTATIVES AT: Calgary • Edmonton • Vancouver • Winnipeg



4333



Same hours, same manpower, yet by changing loaders

INDIANA QUARRY QUADRUPLES PRODUCTION

With the same *number* of loaders, and virtually the same number of man-hours, May Sand & Gravel Company, Fort Wayne, has *quadrupled* production (and sales) over the past few years.

Key to their 750,000 ton yearly success story has been the three Michigan Tractor Shovels they brought in to replace a number of less mobile loading units.

Load 550 trucks with 4,500 tons

Accurate records, covering a two year period, show the three Michigans load from 300 to 550 trucks *every nine hour shift*. During peak days their output totals 4,500 tons—a per-unit per-hour average of 175 tons!

Truckers clear \$25 more per day, end gripes

This excellent record has been compiled with only minor changes in methods. Trucks, for example, still are loaded in the order they come into the pit. Formerly, this practice caused frequent delays, often 20 to 40 minutes, while old-style loaders crawled between stockpiles, or labored to load the tougher materials. Now, *even on busiest days*, the Michigans work so fast no trucker waits longer than 2 to 10 minutes from time he drives into the yard until time he's loaded and pulls off the scales. "Trucker gripes have almost disappeared," says Company President Bill May. "The saving of 10 to 30 minutes in pit service often enables each truck to deliver another load or two a day when on long 15 mile hauls . . . an extra two to four loads a day when on shorter one to five mile hauls. That's an extra profit per truck of \$5

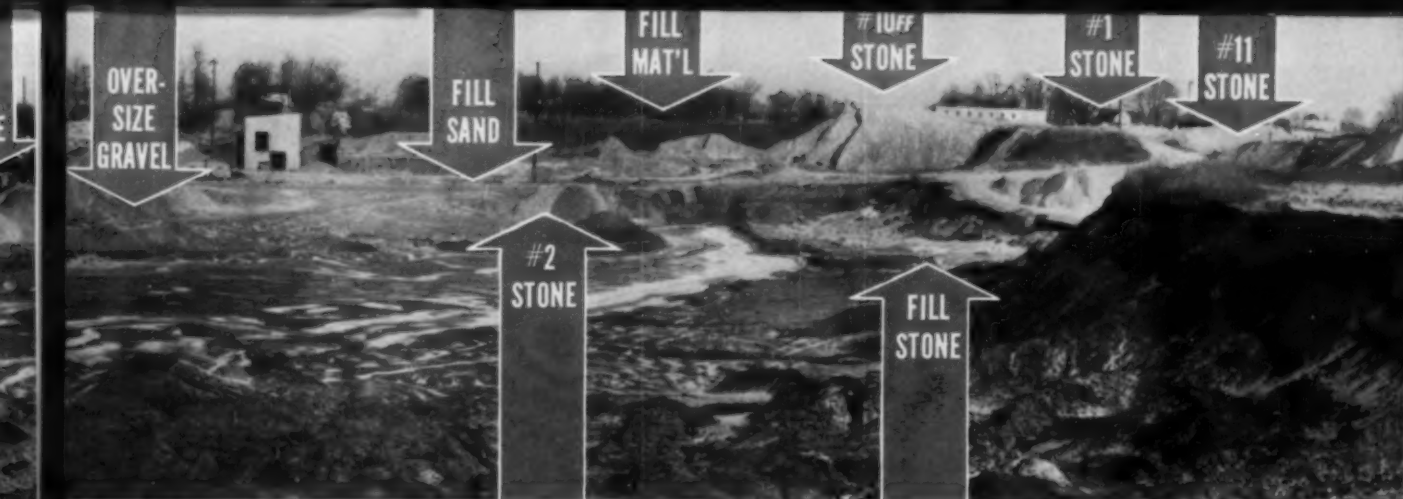
to \$25—or more—every day!"

Fast as trucks between stockpiles

Two major factors combine to produce this time saving. First, the mobile Michigans move from stockpile to stockpile just about as fast as the trucks. Second, the Michigans rapidly load all 10 sizes of stone, two types of gravel, and two grades of sand sold by this plant. Stopwatch measurements, taken from time to time during the past two years, show the 2¾ yard Michigans require only 1½ to 1¾ minutes to heap a 5 yd truck . . . 2¼ to 2½ minutes to load a 9 yarder.

Typical Michigan 2¾ yd load of #14 sand, heaviest of 14 materials handled, weighed out on company scales at 9,000 lbs.





Truck-like speed between stockpiles saves about 1 1/4 hours per day over crawler-loaders formerly used. Supt. Rooney estimates this time saving, plus lowered repairs, plus faster loading nets his company \$70 extra profits per Michigan per shift.

Easy accessibility speeds maintenance

Another important factor in increased plant production has been *dependability*. May Sand and Gravel records show that *not once* in 5 1/2 machine years has a Michigan missed more than a few hours of work. "Sure, we expect our rough service to take its toll," says Jim Rooney, Supt. "But we have a regular program of daily and 100 hour maintenance and inspection that catches what few troubles a Michigan has while they're small. Even when we spot something, even in the rare cases a Michigan breaks down, we always have the machine back to work the next morning! Easy accessibility, skilled workmen, and excellent distributor cooperation make repairs a simple job."

Also do such "extra jobs" as bank loading, pit cleanup

Speed and efficiency help out on extra jobs, too. Three hours every night, and sometimes during the day, one or two

of the Michigans clean the quarry floor (this eliminates need for special tractor). Sometimes they load sand fill from bank direct into trucks. At times they level the gravel stockpiles. From 5 to 10 pm some evenings, two of them load non-blasted bank-run sand and gravel. Three trucks are kept busy hauling 2,000 ft to plant for processing. Only light source is own headlights. Average production: 230 tons per hour. And the Michigans have ended worries about rock shovel breakdowns. Supt Rooney reports production loading shot rock with a Michigan of 190 to 200 tons every hour.

Is it any wonder, with all-around performance like this, that May Sand & Gravel Company think Michigan "tops". We think, if you try one, you'll agree. Make your own test. Call or write to arrange a demonstration. You name the job!

Michigan is a registered trade-mark of

CLARK
EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division
2473 Pipestone Road
Benton Harbor 37, Michigan
In Canada: Canadian Clark, Ltd.
St. Thomas, Ontario

One of Michigan's "spare-time" jobs: hurrying to edge of 30 acre quarry to push off truck-dumped #1 stone.



Excellent service and cooperation from local distributor Deeds Equipment Company is one important reason for May's repeat purchases.





ENGINEERING REPORTS:



MINIMUM LINE VOLTAGE DROP is obtained by locating G-E unit substations near the load. The substations above, rated 750 kva and 500 kva, are two of five which serve the Corbin preparation plant.



ADEQUATE INTERRUPTING CAPACITY, provided by General Electric metal-clad switchgear, helps protect preparation plant equipment and reduces down-time. Units are shipped assembled to save installation time and cost.

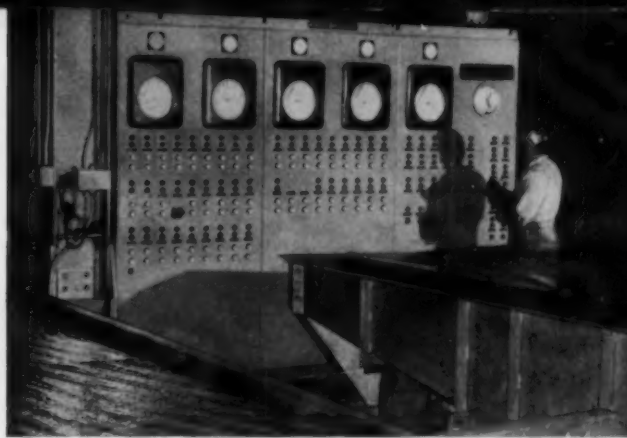
General Electric engineered system helps

DESIGNED FOR EXPANSION to 1200 tons capacity per hour, the Corbin plant processes coal for steel mills.





CENTRALIZED CONTROL for low voltage motors is provided by compact G-E Cabinetrol* panels. Expansion is easily handled by adding new sections to existing lineups.



SIMPLIFIED starting and stopping of all motors in Corbin plant is afforded by two General Electric master control boards for both fine and coarse coal processing circuits. Unit shown above hangs from ceiling to avoid vibration.

Corbin Coal Plant increase output

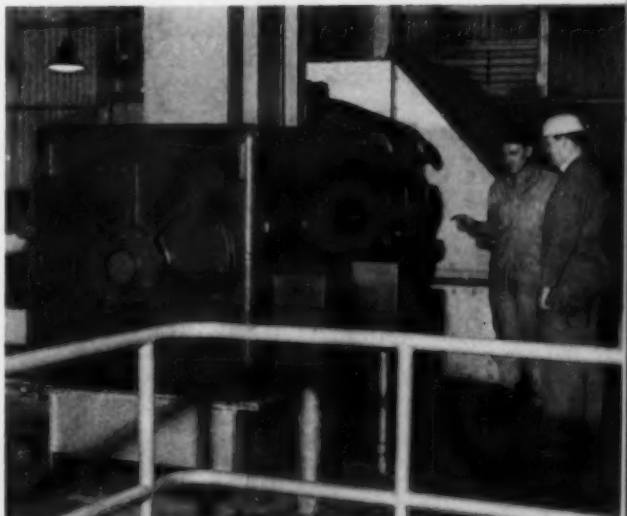
Integrated General Electric power distribution and drive units help achieve continuous processing of uniform-quality coking coal

At its new Corbin, Ky., coal preparation plant, U.S. Steel processes and blends coals to a uniform low ash-content for use in steel mill coking ovens. The plant is designed to process coal at the rate of 600-tons-per-hour. However, the raw coal incoming feed belt is designed to handle a 1200-tons-per-hour capacity. The plant and electrical system are laid out to permit this later expansion.

General Electric system engineers worked closely with U.S. Steel and its prime contractor, Allen & Garcia Co. of Chicago, to provide a flexible, well-integrated power system. Such a system helps minimize outages, reduces maintenance costs, and processes more tons of coal per man-hour of labor. A feature of the distribution system is the provision made for expanding facilities through addition of new load-center unit substations to plant primary power systems.

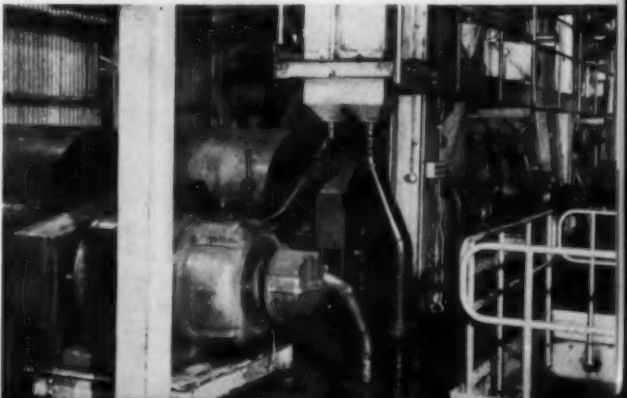
Co-ordinated in the electrical system are 165 General Electric motors totalling 5490 horsepower and controlled by compact G-E Cabinetrol* motor-control centers. Carefully timed delivery of General Electric equipment to meet the installation schedule allowed the plant to begin operation earlier than expected.

Whatever your electrical needs, General Electric engineers and equipment can work for you. Contact your nearest Apparatus Sales Office or write for Bulletin GEA-5308. General Electric Company, Section 663-46, Schenectady 5, N. Y.



PROTECTED against wear, damage and breakdown, this General Electric 350-hp Tri-Clad* wound rotor motor drives Corbin coal preparation plant's 830-foot by 54-inch incoming raw coal feed conveyor belt to a height of 150 feet.
*Registered trade-mark of General Electric Co.

STURDY, totally-enclosed 150-hp General Electric motors, offering protection against abrasive coal dust and corrosion with new "miracle" insulations, drive centrifuges for dewatering coal in Corbin plant's fine coal processing department.



Engineered Electrical Systems for the Coal Industry

GENERAL  **ELECTRIC**

Here's How... to make a **PROFIT** from **COAL FINES**



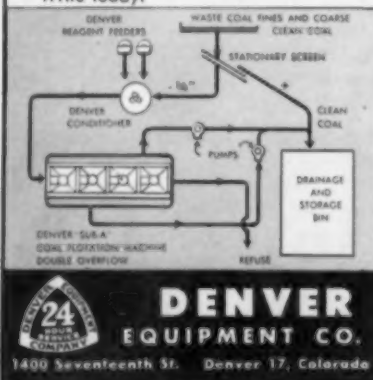
with **DENVER "Sub-A"** **COAL FLOTATION**

Simple...Low Cost!

You can handle coarse coal ($-\frac{1}{8}'' \times 0''$) at the head of your circuit in DENVER "Sub-A" Flotation Machine. You save coarse as well as fines in a coal product which is easily dewatered! You have simple, low-cost system.

Over 90% of all coal flotation plants in U. S. are Denver "Sub-A", an outstanding testimonial to DECO's experience, engineering "know-how" and equipment.

DECO can provide complete testing, engineering service, flow-sheet design and all equipment for your coal flotation plant. One source of supply, one responsibility. Write today!



**DENVER
EQUIPMENT CO.**

1400 Seventeenth St. Denver 17, Colorado

Personal Notes

W. A. Morris was elected executive vice president of the Dawson-Daylight Collieries Cos., Dawson Springs, Ky. The companies include the Dawson Coal Co., the Dawson Daylight Coal Co., Dawson Collieries, Dawson Coal Sales Co., and Daylight-Collieries Stores. Mr. Morris will share operational responsibilities for all the companies with W. A. Borries, president of the Dawson-Daylight and the Dawson Collieries Cos., and with V. C. Roerk, president of the Daylight-Colliers Stores.

Harry C. Ballman joined the Bituminous Coal Institute staff as manager of field services. Mr. Ballman will work on the problems of achieving more widespread use of coal in public and private buildings.

Josh B. Taggart was elected president and chief executive of the Wise Coal & Coke Co., Dorchester, Va. He was vice president in charge of operations before the move up. Mr. Taggart has been associated with Wise Coal & Coke since 1934.



Henry F. Hebley, Pittsburgh Consolidation Coal Co. research consultant, was selected to receive an honorary membership in the Air Pollution Control Association. The selection was based on outstanding service to the association during the past 15 year.

J. W. Pero was appointed to the newly-created post of assistant vice president of operations, Pocahontas Fuel Co., Pocahontas, Va. Mr. Pero was formerly director of safety and mine inspection. He joined Pocahontas in 1943.

Willard P. Chamberlain joined the Cherry Hill Coal Corp., Cleveland, Ohio, as vice president in charge of finance. Mr. Chamberlain returns to the coal industry after a 2 yr absence, during which he was associated with the F. C.

Russell Co. In his new job he will be responsible for part of the sales and operating activities of Cherry Hill.

Carl A. Marshall was appointed vice president of sales for the Warner Collieries Co., Mammoth, W. Va. Mr. Marshall brings to Warner Collieries experience acquired since 1925 with Florida Power & Light Co., Combustion Engineering Corp., North American Coal Corp., Consolidation Coal Co., and the Fairmont Coal Bureau.

John E. Dodson was elected vice president in charge of coal properties for the Lehigh Coal & Navigation Co. As a result, Mr. Dodson relinquished his post as president of Weston Dodson & Co. He is being succeeded there by Truman Dodson.

John L. Coleman was appointed assistant superintendent of the Gorgas mine, Gorgas, Ala. The mine is owned by the Alabama Power Co.

Obituaries

L. Roy Muir, president of Crummies Creek Coal Co., Kentucky, died in Harlan, Ky., May 7. Mr. Muir was 63. A native of Rockport, Ky., Mr. Muir joined the Crummies Creek Coal Co. in 1921 when it was organized. He was named its president last year.

Dr. Frank Hynes Reed, chief chemist of the Illinois State Geological Survey since 1931, died April 27, in Urbana, Ill. Dr. Reed was 67.

Joseph V. Mather, a U. S. Bureau of Mines engineer, Kingston, Pa., died May 15 at the age of 49. Mr. Mather, a USBM engineer for 16 yr, was a native of Beckley, W. Va. He was graduated from the University of Wisconsin. Before joining the USBM he was chief engineer for the Premier Coal Co., W. Va.

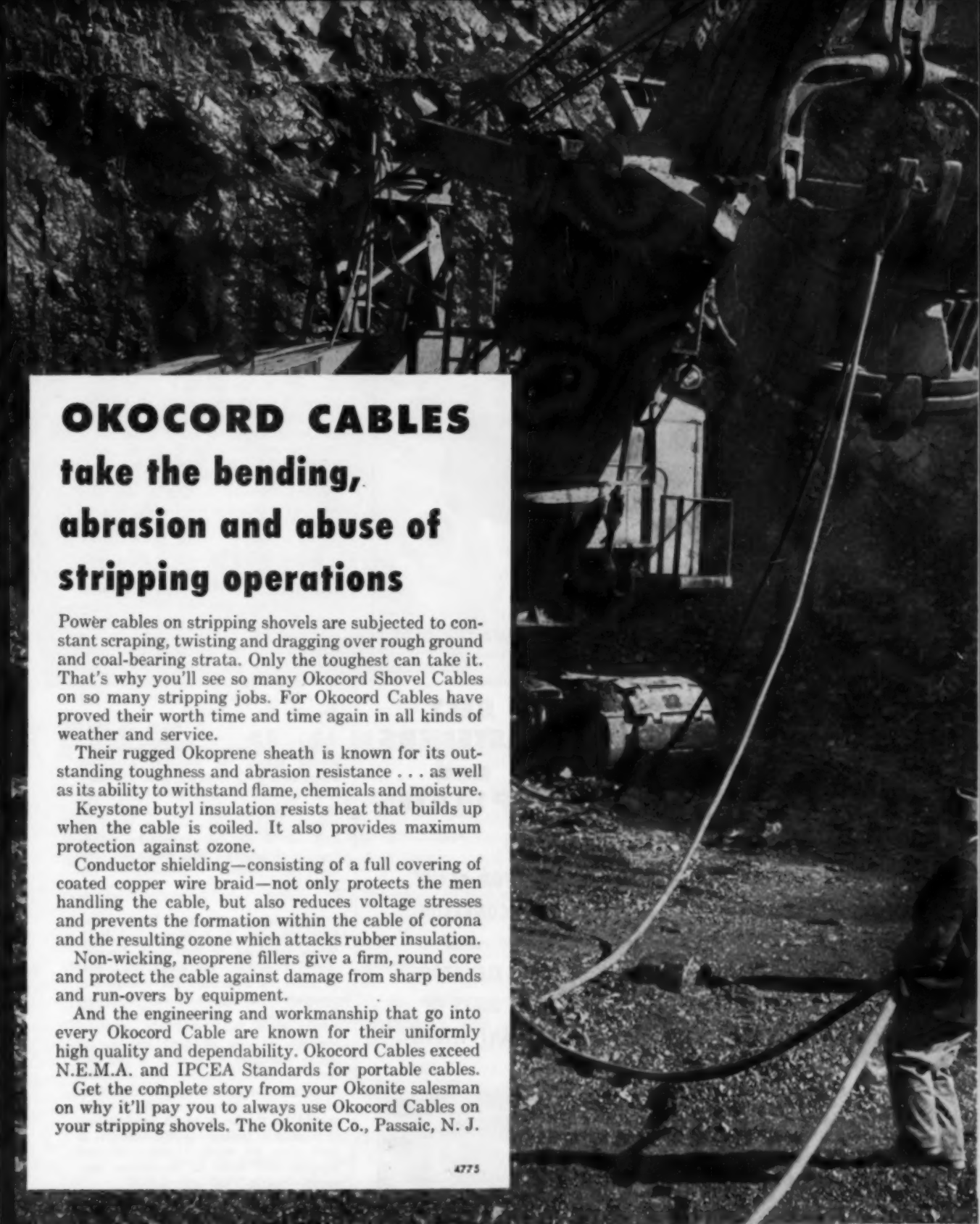
MEETINGS

West Virginia Coal Mining Institute, June 14, 15, Fairmont Hotel, Fairmont, W. Va.

Open Pit Mining Association, Annual Meeting, June 20, University of Illinois, Urbana, Ill.

Rocky Mountain Coal Mining Institute, Annual Convention, June 23-26, Hotel Colorado, Glenwood Springs, Colo.

International Briquetting Association, Biennial Conference, Aug 19-21, Colorado Hotel, Glenwood Springs, Colo.



OKOCORD CABLES

take the bending, abrasion and abuse of stripping operations

Power cables on stripping shovels are subjected to constant scraping, twisting and dragging over rough ground and coal-bearing strata. Only the toughest can take it. That's why you'll see so many Okocord Shovel Cables on so many stripping jobs. For Okocord Cables have proved their worth time and time again in all kinds of weather and service.

Their rugged Okoprene sheath is known for its outstanding toughness and abrasion resistance . . . as well as its ability to withstand flame, chemicals and moisture.

Keystone butyl insulation resists heat that builds up when the cable is coiled. It also provides maximum protection against ozone.

Conductor shielding—consisting of a full covering of coated copper wire braid—not only protects the men handling the cable, but also reduces voltage stresses and prevents the formation within the cable of corona and the resulting ozone which attacks rubber insulation.

Non-wicking, neoprene fillers give a firm, round core and protect the cable against damage from sharp bends and run-overs by equipment.

And the engineering and workmanship that go into every Okocord Cable are known for their uniformly high quality and dependability. Okocord Cables exceed N.E.M.A. and IPCEA Standards for portable cables.

Get the complete story from your Okonite salesman on why it'll pay you to always use Okocord Cables on your stripping shovels. The Okonite Co., Passaic, N. J.

4775



where there's electrical power . . . there's **OKONITE CABLE**

SUTPHEN'S WOOD PIPE FOR MINE SERVICE

Sutphen machine-made wood pipe is recommended for all types of mine service. It is particularly endorsed for drainage lines.

WOODS USED: California red wood, clear, all heart stock—rot resistant and termite resistant. White pine. Hard pine. Special hard wood—for flushing culm and other abrasive materials. Wood pipe is not affected by electrolysis.

SIZES Made in sizes from 3 in. up to and including 24 in. for pressures up to 172 lb. per sq. in. Pipe lengths up to 12 ft. Shorter lengths can be furnished to lay around curves without fittings. (Sutphen wood pipe carries 14% more water than metal pipe due to less friction.)

JOINT FITTINGS: Fittings can be supplied for connections to either wood or metal pipe.

COST OF LAYING: Much less than for cast-iron pipe. No special labor or material needed in making joints. It's lightness permits easy laying.



PETER O. SUTPHEN WOOD PIPE showing Tenon and Socket Joints which drive tight and swell tighter after saturation.

PETER O. SUTPHEN (Est. 1943)

SUCCESSOR TO A. WYCOFF & SON COMPANY (EST. 1855)

UNDERGROUND AND EXPOSED WOOD WATER PIPE

Box 58

Everett, Pa.

Phone 39

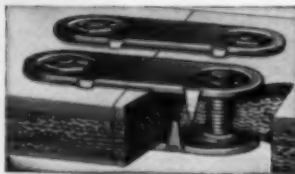


BELT FASTENERS and RIP PLATES



**FOR HEAVY
CONVEYOR
AND
ELEVATOR
BELTS OF
ANY WIDTH**

- ★ FLEXCO Fasteners make tight butt joints of great strength and durability.
- ★ Trough naturally, operate smoothly through take-up pulleys.
- ★ Distribute pull or tension uniformly.
- ★ Made of Steel, Monel, Stainless, Everdur. Also Promal top plates.
- ★ FLEXCO Rip Plates are for bridging soft spots and FLEXCO Fasteners for patching or joining clean straight rips.



Compression Grip distributes strain over whole plate area

Order From Your Supply House. Ask for Bulletin F-112

FLEXIBLE STEEL LACING CO., 4438 Lexington St., Chicago 44, Ill.

Current Coal Patents

By Oliver S. North

Pintle construction for cutter chains, A. O. Bruestle (assigned to The Cincinnati Mine Machinery Co., Cincinnati, Ohio), Apr. 16, 1957. This improved pintle construction for connecting the link elements of a coal mining machine is stronger than previous pintle structures, and gives longer wear under conditions of high speed operation, where vibration and strain are very pronounced. No. 2,788,670.

Generation of carbon monoxide and hydrogen by underground gasification of coal, E. F. Pevero and H. V. Hess (assigned to The Texas Co., New York, N.Y.), Apr. 16, 1957. In a method for preparing a coal bed for underground gasification, provision is made for a mineral acid, such as sulfuric acid, to drip onto the seam at many points, forming numerous irregular passages that are very permeable to the gaseous reactants used later. No. 2,788,956.

Washer device for coal or other granular material, A. A. Hirst (assigned to Coal Industry (Patents) Limited, London, England), Apr. 23, 1957. An improved coal washer of the pulsating grid type provides means for indicating variations in the depth of the refuse bed, thereby permitting better control of the operation. A calibrated pressure or volume indicator can be read off directly. No. 2,789,568.

Power driven cutting mechanism having means for movably mounting cutter bits, J. C. Buttrick, Apr. 23, 1957. Improvements in chain driven or rotary coal cutting mechanisms whereby the friction back of the cutting point of each bit is eliminated, thereby reducing the destructive heat generated, and lessening power requirements. No. 2,789,806.

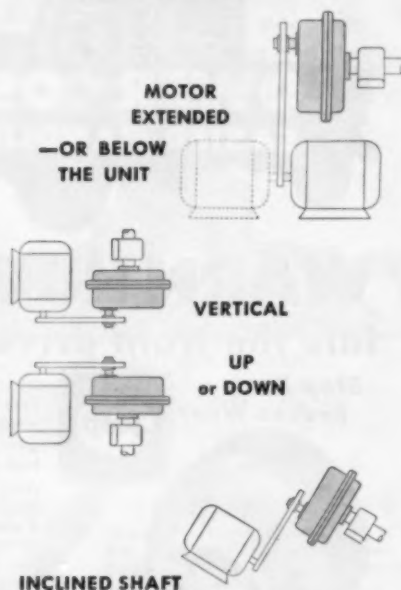
Transportation of coal by pipeline, J. T. Clancey, T. J. Regan and E. J. Wasp (assigned to Pittsburgh Consolidation Coal Co., Pittsburgh, Pa.), May 7, 1957. In a method for transporting commercial quantities of coal by pipeline, a slurry containing 35 to 55% by weight, of coal is pumped through a large diameter pipeline at linear velocities of 4 to 7 ft per second. A critical factor for obtaining maximum energy efficiency is the sizing of the coal particles, the bulk of which should be in the 6 to 28 mesh range. If a sizable portion of the material is finer than 28 mesh, clogging in coal hoppers and handling equipment may result. No. 2,791,471.

Mining machine with side cutting disk, J. Herrmann (assigned to Gewerkschaft Eisenhuetten Westfalen, Lünen, Westfalen, Germany), May 7, 1957. Design for a coal mining machine having

These versatile units save space, power, material, time...

SIX SIZES— $\frac{1}{2}$ to 30 HP—420 to 10 rpm—single and two double reduction ratios. Output torque ratings up to 21,000 lb-in.

A FEW OF THE MANY POSSIBLE DRIVING ARRANGEMENTS



FALK ALL-STEEL Shaft Mounted Drives

The photograph above typifies the way FALK Shaft Mounted Drives furnish the economical solution to problems of efficient speed reduction in a limited space. Within their rated capacities, these versatile reducers are designed to drive any machine and to fit any space requirement.

FALK Shaft Mounted Drives mount on the driven shafts and are connected by V-belt or chain to any convenient rotating power source. Unlimited choice of output speeds between 420 and 10 rpm is made possible by varying the ratio of driving sheaves or sprockets.

These units, with precision-cut gears of highest efficiency, use a minimum of power. They need no adjustable motor bases or slide rails; thus they save material. And, because they are readily available and easily installed or moved, they save time. Best of all, they are backed by FALK's unmatched experience in precision-gear manufacture.

Promptly available from factory and distributor stocks, from coast to coast. Ask your Falk Representative or Distributor for details—or write us for **Bulletin 7101**.

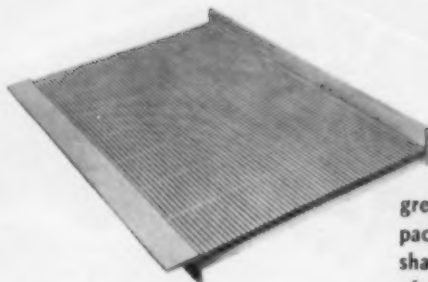
THE FALK CORPORATION, 3001 W. CANAL ST., MILWAUKEE 1, WIS.

Representatives and Distributors in Most Principal Cities

- | | | |
|--|---|--|
| <p>Manufacturers of</p> <ul style="list-style-type: none"> • Motoreducers • Speed Reducers • Flexible Couplings • Shaft Mounted Drives | <ul style="list-style-type: none"> • High Speed Drives • Special Gear Drives • Single Helical Gears • Herringbone Gears | <ul style="list-style-type: none"> • Marine Drives • Steel Castings • Weldments • Contract Machining |
|--|---|--|

FALK
...a good name in industry

GIVES COAL A REAL CLEAN SCREEN!



You keep coal quality high when you give it a Hendrick Wedge Slot screening! Hendrick Wedge Slot has the kind of small openings that assure fine screening yet affords far

greater draining and screening capacity. Profile bars are "precision shaped" to maintain uniform width of slot openings the entire length of the screen as wear progresses. For details on the Hendrick Wedge Slot Screen best suited to afford long life under your specific operating conditions, write Hendrick today.

Hendrick MANUFACTURING COMPANY

41 DUNDAFF STREET, CARBONDALE, PA.

Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens •
Hendrick Wedge Wire Screens • Architectural Grilles • Mitco Open Steel
Flooring • Shur-Site Treads • Armorgrids • Hydro Dehazers
• Petrochemical Column Internals



WARN HUBS

idle the front drive in 2-wheel drive

Stop Drag
Reduce Wear



OVER 100,000 WARN HUBS NOW
IN USE ON 4-WHEEL DRIVES



Free-wheeling 2-wheel drive with Warn Hubs means big savings in gear, engine, tire wear, gas, plus the pep, speed, performance and high gear power of any 2-wheel drive.

And now, with Warn Lock-O-matics, you have free-wheeling 2-wheel drive, or normal 4-wheel drive automatically, as you shift! When you need traction, you have it! When you shift to 2-wheel drive, you always have free-wheeling 2-wheel drive—with no drag, front gear whine, shimmy. Warn Lock-O-matics truly make "two vehicles out of 1!"

Ask your truck dealer for a free demonstration of Warn Lock-O-matic or Locking Hubs (manual control), or write for literature today! Models for all 4 w.d.s. to 1½ tons.

WARN MFG. CO. RIVERTON BOX 6064-06,
SEATTLE 88, WASHINGTON

Coal Patents (Continued)

ing a side cutting disk that is eccentrically mounted on a revolving drive shaft. The machine can be caused to cut in either direction along the face without changing the direction of rotation of the drive shaft. No. 2,791,411.

EQUIPMENT APPROVALS

Eleven approvals of permissible equipment were issued by the U. S. Bureau of Mines during April.

Joy Mfg. Co.—Type 148U9-3AE loading machine; five motors, one 4 hp and four 15 hp, 250 v, DC. Approval 2-1217. (Approval No. 2-1217A covering 500-v loading machines of this type was issued to Joy Mfg. Co. Feb. 15, 1957.)

Goodman Mfg. Co.—Bridge conveyor; one motor, 7½ hp, 250 v, DC. Approval 2-1231, April 4, 1957.

Manson Machine Co.—West rock dust distributor; one motor, 10 hp, 22/440 v, AC. Approvals 2-1232-1232A, April 9, 1957.

Jeffrey Mfg. Co.—Type 76CM Col-mol; three motors, two 100 hp and one 50 hp, 250 v, DC. Approval 2-1233, April 11, 1957.

Jeffrey Mfg. Co.—Type 78—A Molveyer; 43 motors, 23 2 hp and 20½ hp, 220 v, AC. Approval 2-1234, April 16, 1957.

Goodman Mfg. Co.—Type 192-36 Ropex conveyor; two motors, each 25 hp, 250 v, DC. Approval 2-1235, April 24, 1957.

Goodman Mfg. Co.—Type 300 border; one motor, 175 hp, 440 v, AC. Approval 2-1236A, April 24, 1957.

Joy Mfg. Co.—Type 33BU1-1E loader; four motors, two 25 hp and two 10 hp, 250 v, DC. Approval 2-1237, April 25, 1957.

Joy Mfg. Co.—Type 16SCI-PE-1 (modified by SBM9.02) and 16SCI-PXE-1 shuttle cars; five motors, three 10 hp and two 5 hp, 250 v, DC. Approval 2-1238, April 26, 1957.

Jeffrey Mfg. Co.—Type 87A extensible belt conveyor; six motors, one 1 hp, four 2 hp, and one 25 hp, 250 v, DC. Approval 2-1239, April 26, 1957.

National Mine Service Co.—Marietta miner; three motors, two 70 hp, and one 50 hp, 440 v, AC. Approval 2-1240A, April 29, 1957.

In addition:

Plastic Wire & Cable Corp.—Symbol 124-BM assigned to identify cables that have been accepted by the USBM as being flame and damage resistant.

WESTERN
HEMISPHERE

EASTERN
HEMISPHERE



CINCINNATI CUTTER BAR

CINCINNATI
SPROCKET

“CINCINNATI MINE” IS WORLD FAMOUS

THE WORLD'S FINEST COAL CUTTING EQUIPMENT

In thousands of mines all over the World, Cincinnati Chains, Bits and Bars are helping Mine Operators reduce coal cutting costs. The wide acceptance of Cincinnati Coal Cutting Equipment over a period of years is proof of its top performance and dependability . . . proof of the soundness of the engineering and design built into Cincinnati Coal Cutting Equipment. If you have a particular cutting problem, let us hear from you. The chances are we can help you as we have helped hundreds of the world's largest producers. Feel free to call on us or any one of our representatives at any time.



DUPLEX C-11

For all-purpose cutting, this bit offers the best obtainable value in cutterchain bits. Available in various grades . . . is reversible and double-ended . . . has sharp points . . . keen cutting edges . . . long life . . . locks securely . . . easily removed.



DUPLEX F TYPE—PLAIN

This bit gives you dependable service under the toughest cutting conditions (where other bits have failed) due to its specially reinforced tip which provides a stronger cutting point.



DUPLEX F TYPE TIPPED BIT

Where cutting conditions are favorable to tipped bits . . . Cincinnati's exclusive tipping process makes this the lowest cost throw-away type carbide tipped bit available.



CINCINNATI STANDARD CHAIN

Similar in design to the DUPLEX . . . accommodates either standard mine sharpened bits or the popular Stanex Holder and Bit.



STANEX MOUNTING

Combination of strong durable holder and Stanex reversible Double Ended Bit to fit Cincinnati Standard Chain or other standard chains.



CINCINNATI DUPLEX CHAIN

The Cincinnati Duplex Chain with the Duplex Bit is recommended for maximum cutting efficiency. The block and connector are drop forged of high grade alloy steel, carefully heat treated and scientifically engineered to withstand hard usage.

THE CINCINNATI MINE MACHINERY CO.

2983 SPRING GROVE AVENUE • CINCINNATI, OHIO



NEW TRUSCON STEEL "BUDGET" OFFER TOP UTILITY AT LOW,

Here's the latest design by the pioneer of prefabricated steel buildings. Simplified design using standard Truscon products brings the cost down low. It's a quality building, with a tight, dense, galvanized coating that's the product of a new Republic Steel continuous galvanizing line. More rust-resistant than ever. No painting needed.

Truscon "Budget Buildings" now are available for immediate delivery in widths of 32, 36, 40, 44, and 48 feet . . . 12- and 14-foot heights . . . lengths as long as you want to make them. All elements are

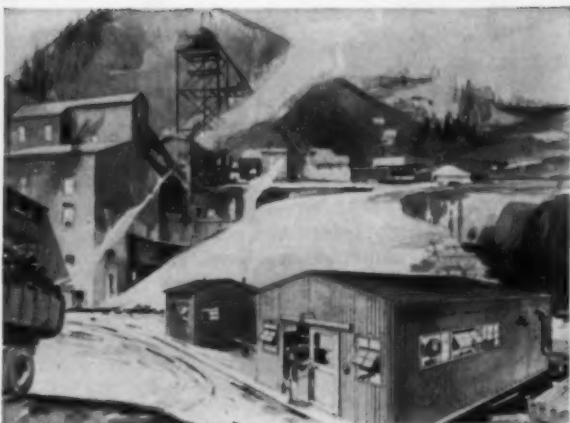
engineered for fast on-site erection. When erected, you have a fire-resistant building that's smartly styled, and designed for community acceptance. Dis-assemble, move, and re-erect it where and when you please.

Your "Budget Building" order will be filled fast from "off-the-shelf" stocks of pre-engineered materials. It will be shipped to your site as a package—all roofing, siding, windows, doors and hardware included. When you need a building and you're tied to a budget, give Truscon a call. Send coupon for facts.

REPUBLIC



World's Widest Range of Standard Steels



FOR MINING Truscon's new building is lightweight, flexible, can be erected quickly at mine and field locations. Strong and sturdy, it provides protection for field crews, engineers, administration staffs, offices, and emergency medical stations. It is built for permanency, engineered for easy removal.

BUILDINGS" LOW COST



FOR TRANSPORTATION Doors and windows are available in a choice of sizes, types, and locations. Doors can be swing or slide types of standard Truscon construction and design. The new building is recommended for freight yards, passenger depots, maintenance depots, and other applications in rail, air, highway, and water transportation.

STEEL

and Steel Products



FOR INDUSTRY This new Truscon Steel Building offers the savings of standardization. Recommended for storage and warehousing, office space, plant protection, tool and parts depot, many more applications. You can standardize systems, methods, inventories, in various locations.



FOR OIL AND GAS Truscon's rigid frame design permits unobstructed head room for storing equipment and machinery. Roofing and siding are rust-resistant galvanized steel. No painting required. Area can be increased by extending either end. Building can be disassembled, trucked to new location and re-erected.

TRUSCON STEEL DIVISION REPUBLIC STEEL

DEPT. C-4117

3124 ALBERT STREET • YOUNGSTOWN 1, OHIO

Please rush more details on the low-cost Truscon Standard Steel Building.

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

The original bit with the enclosed tip



Designed to take advantage of the extremely high compressive strength of Carboloy cemented carbide. Has the ability to withstand more abuse than any other design without breakage or loss of tip. Results to you:

1. Fewer bit changes
2. More coal production' per bit and per shift
3. Reduced downtime costs

WHY CARBOLOY® CCS-2 BITS MINE MORE PER SHIFT, AT LOWEST COST PER TON

The Carboloy CCS-2 Heavy-Duty Bit combines high-speed cutting efficiency with low-cost operation. From tip to shank, it's designed for longest service . . . cutting through toughest formations.

The CCS-2 is the original bit with the enclosed tip. Inserted at the best angle to withstand cutting forces, the carbide is held in place by a combination of 360° braze and mechanical holding. This design, plus the flare of steel behind the tip, gives maximum protection against "break-out" . . . means more production per tool, less downtime for bit changes.

There's longer life built into the shank, too. It's specially heat-treated steel with a hard core

to resist bending and breaking . . . with a softer "skin" for positive seating of the set screw.

These are the reasons the Carboloy CCS-2, with its 1¾" stop, is the most widely accepted bit in the mining industry. It's ideal for continuous miners and conventional machines using ½" x 1" bits.

The CCS-2, like all bits in the complete line of Carboloy mining tools, is stocked locally for immediate delivery. For more information, or in-mine assistance, call your Authorized Carboloy Mining Tool Distributor (listed on the opposite page). Or write: Metallurgical Products Department of General Electric Company, 11120 E. 8 Mile Ave., Detroit 32, Mich.

Progress Is Our Most Important Product

GENERAL  ELECTRIC

Among the Manufacturers

This was the news:

The Olin Mathieson Chemical Corp. formed the Olin Mathieson International Corp.

The new company is a wholly-owned subsidiary and is headed by Henry A. Arnold. Before the appointment Mr. Arnold had been a vice president of Olin Mathieson in charge of South American operations.

H. K. Porter Co., Inc., acquired R. Thomas & Sons, Inc., manufacturer of high voltage and electrical porcelains.

The Thomas operation at Lisbon, Ohio, will be combined with Porter's Delta-Star Electric Div. The acquisition is the second by Porter in as many months. In April it acquired the Federal Wire & Cable Co., Ltd., Guelph, Ont. Porter is swinging more heavily toward the electrical business because the company believes there are "attractive growth possibilities during the next 5 to 10 yr."

American Biltrite Rubber Co., Inc., and Boston Woven Hose & Rubber Co. merged.

Under terms of the merger Boston Woven Hose & Rubber became a division of American Biltrite. Stockholders approved the merger late in April. Officers of Boston Woven Hose will continue as officers in the new division.

The Du Pont Co. sold its "Ventube" rubberized flexible ventilating duct and explosives bag business to Hanover Industries, Meriden, Conn.

Du Pont will continue to manufacture the base material, "Ventube" rubberized cloth, but Hanover will manufacture and sell the finished products, including explosives bags and flexible ducts. A transfer of manufacturing equipment began May 7.

Union Carbide & Carbon Corp. shortened its name to Union Carbide Corp.

In addition, the names of three Union Carbide divisions were changed. Carbide & Carbon Chemicals Co. became the Union Carbide Chemicals Co.; Linde Air Products Co. became the Linde Co.; and Carbide & Carbon Realty Co. became the Union Carbide Realty Co. Union Carbide's major producing plants, which manufacture approximately 400 synthetic organic chemicals, are situated in West Virginia, Indiana, New York, Texas, and California.

American Cyanamid Co. changed the name of its Mineral Dressing Dept. to Mining Chemicals Dept.

The department manufactures and

sells chemicals which are used for processing ores and non-metallic minerals. It also provides technical services through its engineering field representatives.

The Olin Revere Metals Corp. became the Ormet Corp.

Ormet, which expects to produce 180,000 tons of aluminum a year, is owned jointly by Olin Mathieson Chemical Corp. and by Revere Copper & Brass, Inc. The joint activity by the two companies is a limited one. After delivery of the primary metal produced by Ormet the two parent companies will sever the partnership. The name of Olin Revere was changed to Ormet to head off confusion concerning the extent of the joint effort.

Mine Safety Appliances Co., Pittsburgh, acquired the industrial and mining distributorship for "Scotchlite" brand signs.

The company says it will carry a complete line of standard or special legend signs for in-plant use, plant areas and in and around mining operations.

Lee-Norse Co., Charleroi, Pa., opened a warehouse in Pocahontas, Va.

The warehouse will serve customers in the southern Appalachian region. Equipment, parts and service will be available. The warehouse is the second addition to Lee-Norse facilities. Recently, the company erected an addition to its Charleroi plant to boost production.

Clarence A. Hubert was appointed general manager of International Harvester's Construction Equipment Div.

Mr. Hubert was manager of engineering, Farm Tractor Div., before the appointment.

Koehring Div., Koehring Co., Milwaukee, Wis., announced three new sales and service distributors in Arkansas and Ohio.

The distributors: McDonald Equipment Co., Box 2516, Little Rock, Ark.; Central Ohio Tractor Co., 3765 E. Livingston, Columbus, Ohio; and Minneapolis-Moline Co., Eastern Industrial Div., 215 Brookpark Rd., Cleveland 9, Ohio.

The Ruberoid Co. announced two promotions in its sales organizations in Salt Lake City, Utah, Denver, Colo., and Mobile, Ala.

Promoted were Wilbur C. Neel, manager of the Salt Lake sales district, who became district sales manager of the combined Salt Lake City-Denver

Carboloy Mining-Tool Distributors

Your local Carboloy Mining-Tool Distributor is listed below. His complete stocks guarantee you immediate local delivery.

ALABAMA

Birmingham 2—Shook & Fletcher Supply Co.

COLORADO

Denver 17—Mine & Smelter Supply Co.

ILLINOIS

Mt. Vernon—Central Mine Supply Co.

INDIANA

Terre Haute—The Mine Supply Co., Inc.

KENTUCKY

Harlan—Kentucky Mine Supply Co., Inc.
Lothair—Speck Cornett
Madisonville—Central Mine Supply Co.
Paintsville—Farmer's Supply Co.
Pikeville—Big Sandy Electric & Supply Co., Inc.

NEW YORK

Buffalo 23—Austin Ford Logan, Inc.

OHIO

Cambridge—Cambridge Machine & Supply
Steubenville—Voto Manufacturing Sales Co., Inc.

OREGON

Portland—J. E. Haseltine & Company

PENNSYLVANIA

Johnstown—General Electric Supply Co.
Pittsburgh—General Electric Supply Co.
Washington—Fairmont Supply Co.

TENNESSEE

Knoxville—Crowell Engineering & Sales Co.
Knoxville—W. J. Savage Company

TEXAS

El Paso—Mine & Smelter Supply Co.

UTAH

Salt Lake City 1—Mine & Smelter Supply Co.

VIRGINIA

Andover—Central Supply Co. of Va., Inc.
McClure—Erwin Supply & Hardware Co.

WEST VIRGINIA

Bluefield—Bluefield Supply Co.
Bluefield—Rish Equipment Company
Charleston—Rish Equipment Company
Clarksburg—Rish Equipment Company
Fairmont—Fairmont Supply Company
Montgomery—Marathon Coal Bit Co.
Ravenswood—Fairmount Supply Company
Shinnston—Erwin Supply Co.

CARBOLOY
CEMENTED CARBIDES

Manufacturers (Continued)

sales districts; and Carl H. Thede, manager of the Denver sales district, who became district sales manager of the Mobile sales district.

The Henry A. Petter Supply Co., Paducah, Ky., was appointed an authorized tool distributor by General Electric's Metallurgical Products Dept., Detroit, Mich.

The supply company will carry standard Carboloy brand carbide metal cutting tools, carbide-tipped masonry drills, and diamond grinding wheel dressers. Sales activities will extend in areas of

Illinois, Missouri, Tennessee, and Kentucky.

Clarence H. Mingle, vice president of Gates Rubber Co., was made director of marketing.

The position is a newly-created one. In it Mr. Mingle will be responsible for the coordination and direction of all sales divisions. Mr. Mingle joined Gates Rubber Co. in 1923 in the company's Chicago shipping department. In 1934, after a number of promotions, he became a member of the company's board of management.

E. C. Wilson was elected a vice

president of the Illinois Gear & Machine Co.

Mr. Wilson has been associated with Illinois Gear & Machine since 1942.

William J. Reddington was appointed St. Louis district sales manager of the mechanical goods division of the United States Rubber Co.

Mr. Reddington replaces Hugh Reynolds, who retired February 1. In his new job Mr. Reddington, an associate of U.S. Rubber since 1933, will be responsible for the sale of mechanical goods products ranging from conveyor belting to chemically-resistant plastic pipe.

D-A Lubricant Co., Inc., Indianapolis, Ind., announced two executive changes.

Robert J. Binford, Jr., former sales manager, was named to head the newly formed Western Div., and Charles R. Isaacs was named sales manager. Mr. Binford had been sales manager since 1950. Mr. Isaacs joined D-A Lubricant in 1955.

E. E. Ellis was appointed manager of general industrial sales for the Allis-Chalmers Industries Group.

Mr. Ellis joined Allis-Chalmers in 1942 and had been a sales representative in the company's Detroit office for 20 yr. Recently, he was made a member of the administrative staff of the vice president and general manager of the company's Power Equipment Div.

Leo B. Kelly, Jr., was elected a vice-president of the Penn Machine Co., Johnstown, Pa.

In addition, Mr. Kelly will continue as secretary and treasurer. Penn Machine is a manufacturer of replacement parts for mining machinery.

H. Daniel Robb was promoted to national product manager, alloy steels, Joseph T. Ryerson & Son, Inc.

Mr. Robb moves from the post of manager of alloy steel sales in St. Louis to new headquarters at the company's general offices in Chicago. He joined Ryerson at its Pittsburgh plant in 1946.

Richard W. English was elected president of the Victaulic Co. of America.

Mr. English succeeds M. C. Hutchinson, who was named chairman. F. X. Costanzo was elected vice president of the company's eastern sales division.

Armstrong Equipment Co., 4601 1st Ave., Box 749, Birmingham, Ala., was authorized to sell Michigan tractor shovels and excavator cranes.

The appointment was announced by Clarence E. Killebrew, vice president of the Construction Machinery Div., Clark Equipment Co. The Armstrong company will conduct its sales in Alabama and in a number of Florida counties.

For heavy hauling you'll do better with **JEFFREY 8-wheel Trolley Locomotives**

Big coal loads can be hauled fast with Jeffrey 27, 37 or 50-ton single-unit locomotives.

Operation and maintenance are better, too. The four-wheel, equalized double trucks and the short overhang at the ends give an easy ride at high speed. The eight wheels distribute the locomotive's weight for less concentrated rail loading.

Outstanding operating and safety features include: roller-bearing type journal boxes and motor axle suspensions... air and dynamic service brakes... automatic couplers with air-operated uncoupling... trolley with air-operated retriever... separate blower for each motor.

Other features of 8-wheel locomotives and other types for mainline and secondary haulage are described in Catalog 836. For a copy, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.



MINING • CONVEYING • PROCESSING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING



Why a yieldable type of roof support?

When you are driving a tunnel or drift through formations subject to squeezing pressures, the overburden usually shows only a slight tendency to form its own pressure arch around the opening. Thus some sort of artificial roof support must be quickly created to induce the natural arch, and thus stabilize the surrounding forces as quickly as possible.

Rigid supporting devices cannot indefinitely withstand these dynamic forces; we know of at least one case where 14-in. timbers failed in a matter of weeks. In fact, the more rigid the support, the more aggravated the situation may become. And that's where Bethlehem's Yieldable Arch steps in.

The Yieldable Arch was designed to "give," allowing the overburden to relax slowly into its own natural arch. The more the Bethlehem Arch yields, the more the stress is transferred to the surrounding material. When equilibrium is reached, the Yieldable Arch stands pat. This is why the yielding feature is more important than the actual strength of the Arch.

Yieldable Arches are made of U-shaped rolled-steel segments, heavily flanged to resist torsion. They nest into each other at points of overlap, where they are clamped together with heavy U-bolts. These bolts are drawn tight enough to hold fast under normal pressures; when the pressures become ex-

cessive, friction in the joint is overcome and the arch set yields before deformation occurs.

Because of this, and because they are recoverable, Bethlehem Yieldable Arches usually pay for themselves within their first year of service. Some installations have paid their way in less than six months! Why not call in a Bethlehem engineer and let him give you the full story on the Yieldable Arch?

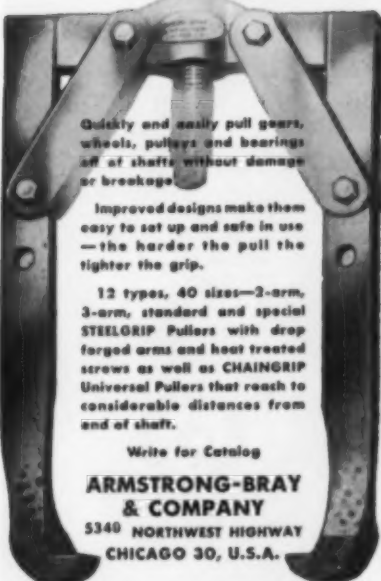
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



ARMSTRONG-BRAY GEAR and WHEEL PULLERS



Quickly and easily pull gears, wheels, pulleys and bearings off of shafts without damage or breakage.

Improved designs make them easy to set up and safe in use — the harder the pull the tighter the grip.

12 types, 40 sizes—2-arm, 3-arm, standard and special STEELGRIP Pullers with drop forged arms and heat treated screws as well as CHAINGRIP Universal Pullers that reach to considerable distances from end of shaft.

Write for Catalog

**ARMSTRONG-BRAY
& COMPANY**

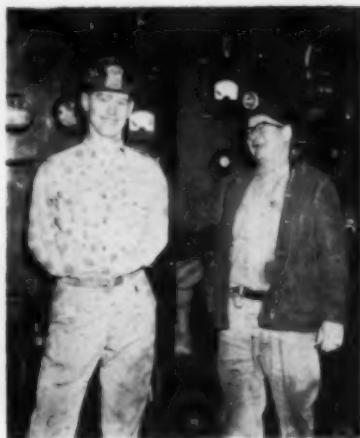
5340 NORTHWEST HIGHWAY
CHICAGO 30, U.S.A.



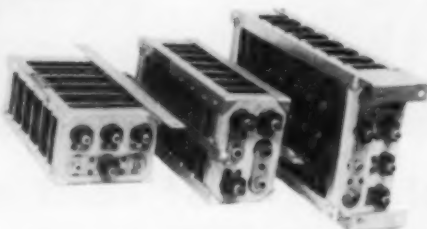
ALABAMA BY-PRODUCTS CORP.—Maxine mine, Maxine, Ala. Marlin McAlpin (left), mine foreman, and W. E. Self, superintendent, travel to working areas in personnel carrier.

COAL MEN ON THE JOB

GUYAN EAGLE COAL CO., No. 1 mine, Amherstdale, W. Va. Steve Dasevich (left), mining engineer, and Harry Smith, chief electrician.



GUYAN RESISTORS for LOADERS



THEY FEATURE—

1. Low cost for a premium class resistor.
2. Non-breakable helical coil construction.
3. Corrosion-resistant chromium alloy steel coils.
4. Light weight for ease of handling.
5. Clamp type bronze terminals for rigid connections.
6. Terminals easily accessible and plainly marked.
7. Fit your machine without alterations.

With mining machines and mechanical loaders becoming so vital to low cost production, GUYAN Resistors have been designed to give trouble-free operation on all types of mechanical equipment.

For a complete line of quality, long life resistance products — consult GUYAN.

GUYAN

MACHINERY CO.
LOGAN, W. VA.



DUQUESNE LIGHT CO., Harwick mine, Harwick, Pa.—Maurice Fowler (left), safety engineer, and Joseph Ocvirk, section foreman, talk safety.



For the tough jobs rely on General Electric mining cables

Jagged rocks, moisture, even chemicals, constantly attack mining cable. In addition, cable may be crushed under heavy equipment, bent, or twisted. For severe conditions like these, it pays to rely on sturdy and resilient General Electric mining cable. These types have proved their outstanding performance on tough jobs:

Mining Machine Cable, Types W and G—Designed for especially severe conditions, such as being dragged behind mining machines, hit by picks, run over by equipment. Is exceptionally flexible, resilient, and abrasion-resistant.

CordX*—A heavy-duty, flexible cord for use on portable electrical equipment where severe usage is encountered and where exceptional mechanical, mois-

ture, heat, and chemical resistance is required. Has U. S. Bureau of Mines approval.

Borehole Cable—A steel-armored cable with extra tensile strength for vertical suspension, either varnished-cambric- or rubber-insulated.

Mine Power Cable—A nonmetallic-sheathed cable for primary distribution to load centers. For use in haulageways, in airshafts, suspended from roof supports, or in boreholes.

FOR FULL INFORMATION on how G-E wire and cable can improve your distribution system, call your General Electric representative or write Section W216-614, Wire and Cable Department, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

Progress Is Our Most Important Product

GENERAL  ELECTRIC

AMC Report (from p 153)

flow. Pregelatinized starch was the final selection since it lends itself to use in automatic mixing equipment. No labor is required beyond periodic replenishment of the feed hopper.

Maximum recovery of fines is now achieved at Robena, and most of the plant water is reused after virtually-complete clarification, Mr. Richards reported. Coarse refuse is trucked away, and minus 28-mesh refuse is pumped to the spill pond after flocculation in the new thickener. The slurry is pumped at 470 gpm (30% high-ash solids) into the pond. Overflow from the pond enters a creek which flows into the Monongahela River. This overflow is clear and has a pH of 7.5 or a little higher. At times when the river is high, the overflow from the pond is returned to the plant for reuse, as it is then clearer than the river water. The built-up plant now handles 1,440 tph and produces coal at 7% total moisture or lower.

Cleaner Streams

"The problems of stream pollution are hazy matters far in the background which irritate coal operators. This attitude is to be regretted, as there are many indications that time is running out."

The problems of production and cost are vital factors that require the coal operator's undivided attention, but other industries are being forced to install treatment plants wherever a method has been developed for processing their particular water-borne wastes, declared Henry F. Hebley, research consultant, Pittsburgh Consolidation Coal Co., Pittsburgh, Pa. Municipalities are also active in the treatment of domestic sewage.

The point of interest to the coal industry in all this activity, Mr. Hebley said, lies in the fact that the funds required to defray the cost of this construction are raised through taxes paid by the populace. To pay for sewage treatment only to be faced with pollution from industrial sources will certainly cause increasing public pressure to be brought to bear on offenders.

In attacking the problem of acid mine water drainage, a two-pronged approach must be employed: Treat with inhibitors the acid-forming material at the mine, or neutralize the drainage of already-formed acid wastes before the discharge reaches the streams.

The whole intent of the treatment consists of removal of sufficient suspended solids to satisfy water-control boards of the various states and interstate compacts. Some states have adopted numerical figures for the permissible quantity of solids in effluent, while some go by appearance alone. Probably the most advanced specifications are those adopted by the Pennsylvania Sanitary Water Board, and if these criteria are adopted throughout the Ohio River drainage basin it will be necessary for a number

of coal-preparation plants to modify their clarification systems.

"The most positive means of inhibiting the formation of acid is by preventing the air from getting at the acid-producing material by covering it with water."

Taking up the problem of stream-pollution related to strip mining, Larry Cook, executive vice president, Ohio Reclamation Association, Cadiz, Ohio, pointed out that covering the material with water is more positive than covering with earth because in the latter case some oxidation can still take place. Then as water filters through the earth cover it picks up the acid and carries it out into the drainage system.

In relating experience in Ohio, Mr. Cook described how operators have been making use of final-cut lakes to prevent formation of acid. Even in contour operations where it is necessary to dam the cut to form the lake it was long ago discovered that water-coverage was the best method. Now these lakes over potentially toxic material abound with fish.

This method is not feasible on the edges of steep slopes where the impounded water might cause slides. In such cases the pit is left open, and the loose material on the bottom is graded to prevent water from standing to form acid pools which could be flushed out by rainfall.

Ohio is fortunate in that only about 5% of the stripping in the state exposes toxic overburden. In these instances it is recommended that the grading be done in such a way that water from the surface is drained into the pit and impounded. This water usually is toxic but the acid gradually leaches out of the material, and over a period of time other elements generally neutralize the water. In some areas, which a few years ago were toxic, fish and vegetation now are supported.

Trends in Cleaning Designs

"The design of a modern coal-cleaning plant is based primarily upon a washability study of the coal to be cleaned and the specifications outlined by the purchaser."

This was the theme of L. A. Updegraff, project engineer, Bituminous Coal Research, Inc., Columbus, Ohio, who laid down four precepts to be observed in designing plants, as follows:

1. The design must insure preparation of a product with quality and uniformity acceptable to the user.
2. Principles of conservation of natural resources must be adhered to by planning for the recovery of all marketable product entering the plant.
3. Design must be such that the plant can be operated at a profit to its owners.

4. It must conform with existing or anticipated air- and stream-pollution laws.

Generally speaking, the equipment needed to meet these requirements is available even though some of it may not be in general use. Fine-coal washers, such as the feldspar jig, promise to accelerate the trend toward including complete fine-coal washing equipment in modern plants, Mr. Updegraff said. A substantial increase in cleaning-plant yield can result from the recovery of extreme fines which have been largely wasted in the past. It has been estimated that 1,000,000 tons of metallurgical fines are lost each year in waste water from cleaning plants. This is a financial waste and a waste of resources. A noticeable trend toward froth flotation has developed and increased use of the process can be expected, Mr. Updegraff predicted.

A trend toward upgrading coals into premium markets is causing changes in design in some cleaning units and increased use of others already available. This is understandable when it is realized that the price for metallurgical coal during the past 2 yr has been from \$1.00 to \$1.20 per ton higher than for industrial or steam coal. A trend in the opposite direction is the increased tendency to simplify loading schedules. Many special sizes formerly thought necessary for sales purposes are being eliminated, and as few sizes as possible are being loaded.

In many new plants the entire ROM is broken or crushed to a specified top size, routed through the cleaning units and then reassembled in a single size unit. Coal prepared for power plants may be handled in this way and loaded as a single resultant. Other noticeable trends include the increased interest shown in water-clarification equipment, and in new methods and units for screening, dewatering and drying in the 28M x 0 range.

Preparation Objectives

"The ultimate in plant design and construction has never been reached and will continue to present an ever-rising mesa as long as research and engineering continue their advance."

The basic objective of a plant is to clean, dry, crush, blend, size and convey in volume the finished product, declared Jack M. Bishop, chief chemist, Truax-Traer Coal Co., Ceredo, W. Va., in his review of preparation practice and directions. Such a plant will minimize economic problems even under the increased cost of operation today. The life of the plant is a split responsibility of the coal company and the design engineers. Management predetermines the seam to be mined, approximate tonnage to be handled, acreage avail-



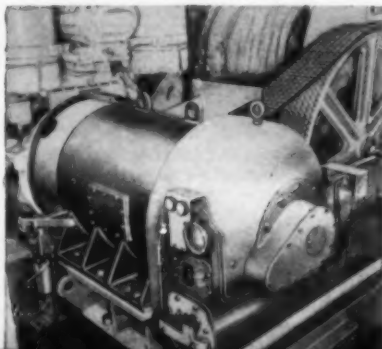
LIMA Type 2400 with Torque Converter moves overburden faster at lower cost

The torque converter, standard equipment on all LIMA Type 2400 machines, is another of the quality features that enable LIMAS to outperform and outlast ordinary machines. It automatically increases torque as required by the load, making higher output possible by avoiding stalling and making performance much smoother and faster.

For assignments calling for an electrically-powered 6-yard machine, the LIMA Type 2400 is available with complete electrical power package. Combining a single AC electric motor with a single stage torque converter, this drive matches, *electrically*, diesel-torque converter performance. You get maximum power performance under all operating conditions . . . and the motor won't stall or burn out.

Cable life is increased and machinery maintenance reduced because shock loading is minimized as the oil in the converter cushions any sudden blow. Friction clutches last much longer because the torque converter reduces friction clutch slippage during acceleration.

LIMA quality design and construction extras make for profitable, efficient operations with minimum downtime. There's a LIMA type and size for every job—shovels $\frac{1}{2}$ to 6 cu. yds., cranes to 110 tons and draglines variable. Smaller capacities are available on rubber. For full details, contact your nearby LIMA distributor, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.



DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD



LIMA SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

BALDWIN - LIMA - HAMILTON

Construction Equipment Division — LIMA WORKS

OTHER DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Loewy-Hydropress • Madsen • Felton • Standard Steel Works

AMC Report (Continued)

able and the market to be supplied. Plant designers provide for management's approval plans which cover installation, preparation processes, equipment and room for alteration in the event of market instability, consumer demand or business needs.

Rising labor costs dictate a need for push-button control in future designs, Mr. Bishop said, in listing some of the units which can minimize the need for human supervision of plant functions. In the past several years multiple crushing has increased in popularity, primarily due to market indifference to carbon on fines. When a single crusher is set to produce a top size of 1½-in coal from 3- or 6-in feed the resultant contains a high percentage of fines. In series crushing the same reduction can be made with a material reduction in the amount of fines resulting.

Freezeproofing is becoming more important, Mr. Bishop said, in describing Truax-Traer's use of from 6.0 to 7.6 gal of spray oil to coat inside railroad cars. Approximately 20 sec is required to coat the inside of a car at a cost of approximately 1c per ton. The oil is applied through a flexible hose equipped with a quick-acting nozzle. Consumer acceptance of the practice has been very favorable, Mr. Bishop reported. Thermal drying of fines and the use of heated water, where this can be done economically, also have been helpful in attacking the problem of frozen coal.

Turning to automatic sampling, Mr. Bishop told of how the tippie foreman at Ceredo is advised of ash analysis within 30 min after coal has been loaded. This is made possible through the use of automatic samplers designed to give full-stream cutting and to insure the sampling of proportionate parts of each size fraction loaded. Better plant control results from the use of these units.

Drying and Dust Collecting

"The first fluidized dryer in the coal industry has been in operation at the preparation plant of the Lynnvile Coal Co. since July of 1955, drying from 70 to 100 tph of fine coal."

Fluidization, as described by A. P. Massman, coal preparation manager, Peabody Coal Co., St. Louis, Mo., is the suspension of solid particles in a stream of gas. To be so suspended the particles must be finer than some limiting size, which will depend on the gas velocity and the specific gravity of the solids. Properly fluidized, the mixture behaves like a liquid. It will seek its own level and can be controlled by suitable valving.

Generally, the Dorco FluoSolids system in use at Lynnvile (Coal Age,

July 1956, p 56) consists of a two-compartment reactor, one compartment for heating air and the other for drying the coal, a pulverizer to crush the coal used as fuel, cyclones to recover solids entrained in the exhaust gases and auxiliary equipment. Fuel coal is fed by gravity to the pulverizer. A small amount of heated air is recycled through the pulverizer to carry the fuel into the combustion chamber. Wet coal, containing about 11% moisture, is delivered to the upper drying compartment by a screw-type feeder where it is fluidized by the hot gases passing through a restriction plate which separates the compartments. Drying is instantaneous because of the rapid transfer of heat between solids and gas. Temperature in the drying chamber is maintained at 145 F. Plus 28M dry coal, making up about 50% of the product, is discharged as overflow from the reactor. The remainder of the product is carried in the stream of exit gases to be recovered in a 2-stage cyclone system. The overflow and cyclone products, averaging about 3% moisture, are blended for final loading.

Maximum capacity of the system has never been determined. Mr. Massman said, in reporting that the unit which was designed for 70 tph feed has handled 107 tph without strain. The feed at times has contained some 1¼-in coal, and at times the feed has contained 20% of plus ¼ in.

Operating costs are estimated to 11c per ton of wet feed, and power consumption for all equipment in the system has varied from 331.3 kwh at 88 tph feed to 338.3 kwh at 97 tph.

One other advantage of fluidized drying, Mr. Massman explained, is that coal is carried from the bed in a relatively cool, highly humid atmosphere. It is thus impossible for the fines to become overdried, and the danger of fires, explosions or oxidation of the fine fraction is minimized. Two other systems were purchased last year by Eastern companies to dry 800 tph of metallurgical coal.

Feldspar Jigging

"A false bed of heavy material on the jig screen prevents loss of lighter fines into the hutch."

A new McNally-Norton feldspar jig at the Roslyn, Wash., coal mines of

the Northern Pacific Railway Co. is the first commercial installation of such a unit in the United States, said E. R. McMillan, manager-coal operations. In the Roslyn installation the false bed consists of burnt shale from the mine refuse bank in a graded size slightly larger than the ¾-in round holes in the jig screen.

The jig action is produced by pulsing air at 2 psi supplied by an Ingersoll-Rand blower. The unit is a 2-compartment 4-cell jig with two elevating conveyors, one for primary refuse and the other for a middlings product which is recirculated through the jig.

Installation of the jig was completed in August, 1956. Mr. McMillan said, in pointing out that he considers the work to be in an experimental stage since changes in control apparatus for governing the water level and air input are still being made. In the latest scheme, standpipes have been built into the sides of the jig to sense the water level with minimum disturbance from the fluctuation of the level in the bath.

In operation, the false bed is opened and closed by the pulsing air to gradually trap and pass into the hutch the heavier small particles. The lighter material is prevented from passing through this false bed and thus is recovered as primary coal or middlings. The false bed in the two leading cells is 6 in thick and in the two final cells 5½ in thick. Present feed is 75 tph of ¾ in x 1mm. In washing raw material from the Nos. 1 and 5 beds in the area the unit is receiving feed containing 33% ash and recovering 71% of the feed averaging 18% ash. Refuse, which is 29% of the feed, contains 70% ash.

Double-Deck Tabling

"Greater economy in construction, less impact on structure and savings in space are advantages of double-deck coal-washing tables."

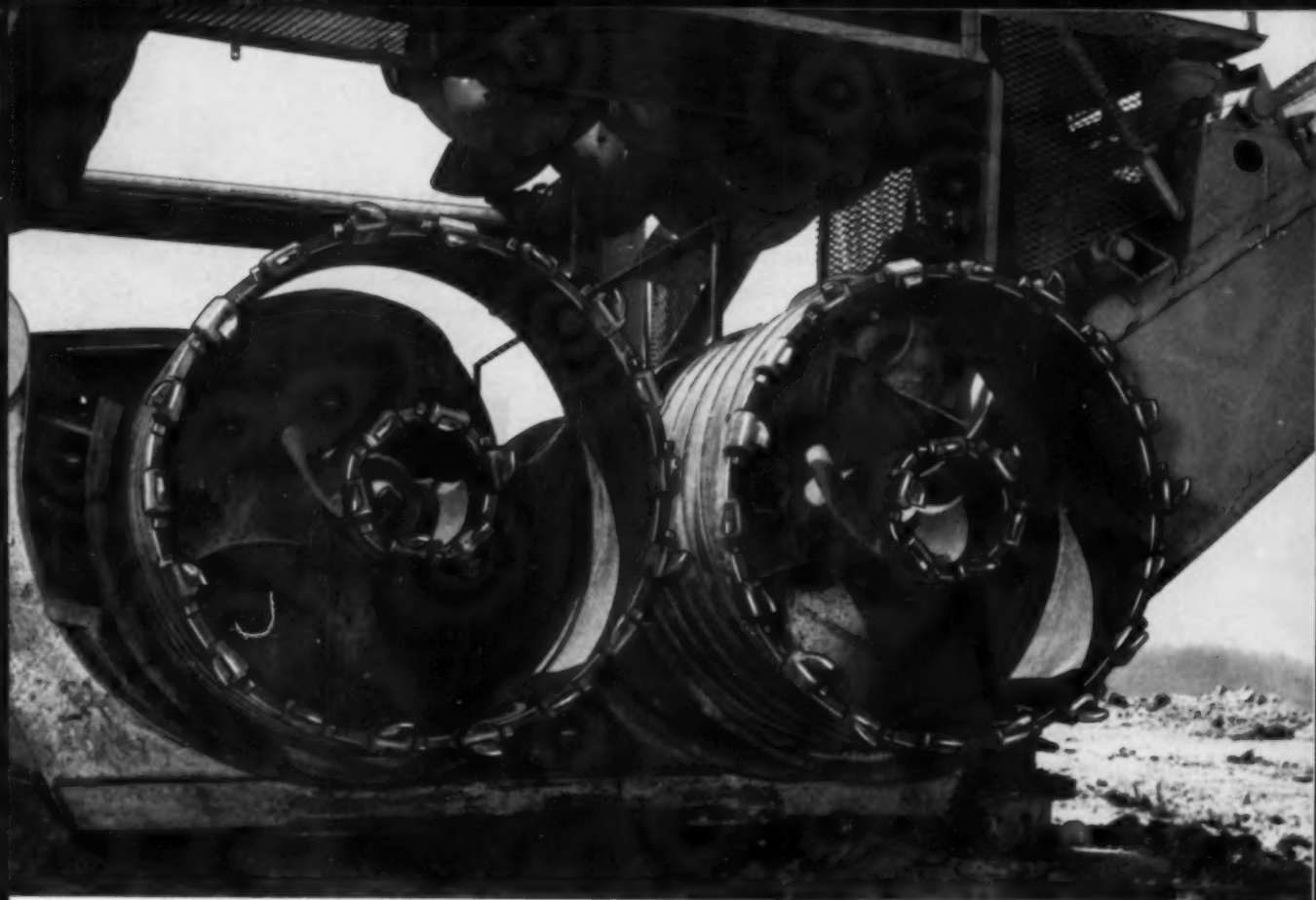
In presenting an illustrated description of the double-deck table, co-authored by F. S. Ambrose, consulting engineer, Fairmont Machinery Co., Fairmont, W. Va., and inventor of the unit, D. H. Davis, vice president, Mathies Coal Co., Finleyville, Pa., explained that the table is suspended by wire ropes with an absolute minimum of attachment to the floor. Motion of the table is controlled by rotating weights on the suspension ropes. The stroke can be closely adjusted through manipulation of these weights.

The unit at Mathies is receiving 9 to 10 tph of 3/8x0 feed and provides exceptionally good results, Mr. Davis said, in making a preliminary evaluation. In fact the unit provides cleaning results similar to those that can be achieved on a single-deck table.

In addition to the advantages previously mentioned, the double-deck table eliminates the need for half the piping required to handle the feed and products of the same plant capacity in single-deck tables.

For Your Library . . .

Coming to you next month is the 1957 Mid-July Coal Age Mining Guidebook and Buying Directory issue, in addition to your regular July issue. The Coal Age Guidebook is an up-to-the-minute reference book on today's mining practices. It also tells who sells the equipment and supplies you need to do a better job. You will want to keep and use it throughout the coming year.



IT'S HERE...THE "Twin Head" AUGER FOR THIN SEAMS...A NEW, EXCLUSIVE Compton of Clarksburg FIRST

FEATURES and SPECIFICATIONS

- Length: 29 feet
- Weight: 26 tons
- Augers: Carries 24—12½ ft. sections
- Power: 1—175 HP and 1—100 HP diesel engines
- Hydraulic Frame Jack Lift: 54 inch
- Auger Diameter: Two heads 24" to 32" each
- Drilling Depth: 150 feet
- Drills within 4¾" of the bottom for maximum recovery.
- Auger sections are racked conveniently on the frame.
- Elevating conveyor is integral part of machine.
- Hydraulic jack legs (with self-leveling pontoons) permit drilling up to 150 feet without misalignment.
- Double vertical overlapping holes can be drilled for greater recovery. Moves easily along working face of highwall.

Here's the new look in augers—the Compton "TWIN HEAD"—it makes thin seam mining feasible and profitable for the first time! Shoulder to shoulder the "TWIN HEAD" cuts, bores and spews forth high hourly tonnage from seams so thin they were once not suitable, nor profitable, for mining with the single headed coal augers.

Write, or call, to have a Compton sales engineer stop around and give you all the facts concerning the new "TWIN HEAD" or one of its "big brothers."

Compton, Inc.
ORIGINATOR OF COMPTON LUMP RECOVERY HEADS
 CLARKSBURG, W. VA.



WHEN LOOKING FOR AUGERS—
LOOK TO COMPTON

What Research Means to American Business

American industry plans to invest \$150 billion in new plant and equipment during the next four years—more than in the five years 1952-1956. It plans to carry out this record investment even though manufacturing capacity has nearly doubled since World War II. These facts are reported in McGraw-Hill's tenth annual survey of Business' Plans for New Plants and Equipment. They contradict many long-established theories about investment in capital goods.

According to the textbooks, a high and rising level of capital investment is generally followed by a decline. The bigger the rise—so the old theory goes—the bigger the decline will be. But, after a decade of high-level investment and an especially strong rise in the past two years, industry now has plans to keep right on with near-record outlays for plant and equipment. Does this mean some new factor has been added, to change the investment cycle?

The New Factor—Research

The latest McGraw-Hill survey points out one new factor which, more than any other, is changing the nature of the investment process. This is the record outlay planned by U.S. corporations for scientific re-

search and development—to create new products and develop new industrial processes. The rapid growth of research in industry, and plans for even more remarkable growth in the years ahead, are shown by the accompanying table.

This year industry plans to spend \$7 billion on research and development—up 20% from 1956. By 1960 it will spend \$9 billion—enough to create a major new industry.

By 1960 manufacturing industry expects sales to be up 26%—with half the increase in products that were not made in 1956.

Growth of Research and Development Expenditures
(Millions of Dollars)

	1955	1956	PLANNED	
			1957	1960
Machinery	408	506	577	704
Electrical Equipment	950	1,149	1,310	1,637
Aircraft and Parts	1,038	1,558	2,274	3,161
Fabricated Metal Products and Ordnance	134	165	174	210
Professional and Scientific Instruments	185	252	300	453
Chemicals	440	498	528	617
Paper, Rubber, Stone, Clay and Glass Products	149	174	196	233
Petroleum Products	171	205	225	277
Other Manufacturing	1,038	1,279	1,388	1,557
Non-manufacturing industries	254	310	347	419
ALL INDUSTRIES	4,767	6,096	7,319	9,269

What Research Is Doing

Here are some examples of how industrial research is opening up new markets, or compelling the modernization of old facilities:

New automatic controls in petroleum refining will raise the quality of gasoline and reduce the time required for production. A new process for recovering oil from depleted wells promises to multiply our potential reserves.

A new process for treating iron ore will permit the ore to be fed directly into steel furnaces—without the need for blast furnaces or coke ovens.

New turbine engines—made possible by the development of heat-resistant alloys for turbine parts—offer greatly increased power for aircraft, ships and automobiles.

Altogether, industry plans to introduce more new products in 1957-1960 than in any previous four-year period. It also plans new processes on a scale that will make much of our present capacity obsolete. These new products and new processes are the secret behind continuing plans for high investment.

One-third of all manufacturing firms are building new plants this year to produce new products, and by 1960 this may account for 10% to 20% of all capital expenditures. At the same time, manufacturing companies report that over half their capital expenditures in the next four years will be for modernization of equipment and introduction of new processes. Thus the preponderant share of new investment will be based on developments growing out of research.

A New Kind of Prosperity

The keen interest of U.S. business firms in scientific research points the way to a new kind of prosperity for our economy—a prosperity based on deliberate creative-

ness. As long as we can create new products that will offer better value to consumers or cut costs to manufacturing firms, business will continue at a high level—not at fever pitch, perhaps, and it is to be hoped not at an inflationary pitch. But based on a steady stream of new products and processes, we can have a high level of general prosperity that defies the old laws of boom and bust.

It's Not Automatic

Of course, there is no guarantee. New products do not spring up by magic as the medieval alchemists hoped they would. They are found as the result of long and expensive effort in laboratories and pilot plants. This effort requires an increasing number of trained scientists and engineers. In 1957 alone, manufacturing companies report they will need 7% more of these highly trained people in research and development. And by 1960, they will need an additional 15% to carry out planned research programs.

The effort to maintain prosperity — as well as the national defense effort — will depend increasingly on this supply of scientific and technical personnel. But if we can supply the people, industry now has the plans for a research effort that will put an end to the spectre of idle plants and idle workers.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT

McGraw-Hill Publishing Company, Inc.



Leman "factory-authorized" repairs will put your equipment back to making profits in a hurry

**PROMPT REPAIR SERVICE
PICK-UP RIGHT AT THE JOB
OF DAMAGED OR WORN
EQUIPMENT**

Yes, even the heaviest mining machines and equipment are back on the job faster when Leman Machine Company does the repair work. A complete, modern machine plant and full staff of specialists enable Leman to assure you of prompt, efficient service that saves time and money.

The plant and equipment layout at Leman's is similar to the manufacturer's production line. There's no wasted motion to boost repair costs and you get workmanship equal to that of the original equipment producer.

LEADING IN MINING EQUIPMENT REPAIRS FOR OVER 35 YEARS

Authorized, recommended agency for repairing Jeffrey Equipment. Equipped to repair, rebuild or remodel all mobile loading and mining equipment and electric locomotives.

Long list of successful repair jobs includes Jeffrey, Joy, Goodman, Lee-Norse, Clarkson, Long, General Electric and Westinghouse mining equipment.

- Restore even heaviest equipment to original condition.

- Make modifications converting old machinery to latest models.

- Equipped to design new parts for specific requirements.

- Pickup and delivery right to job-site reduces down time of equipment.

Phone or write for prompt, courteous service on your repair needs.

LEMAN

MACHINE COMPANY

BOX 236

PORTAGE, PENNA.

PHONE: PORTAGE 2051

CUT CORROSION LOSSES . . . with

USS NATIONAL* Polyethylene PIPE



Gravity flow of mine water from a high sump to a low sump through two four-inch diameter lengths of NATIONAL Polyethylene Pipe.

CORROSION, one of the major destructive forces of a coal mine's atmosphere, has no effect on NATIONAL Polyethylene Pipe. It is resistant to most acids, alkalis, salts and a wide variety of other chemicals. Thus, you can install it and forget about it.

NATIONAL Polyethylene Pipe is tough, too. Rough handling won't crack it, even at low temperatures. And it remains rugged and flexible over its entire working range from minus 90°F. to plus 120°F.

Light and flexible, polyethylene pipe unrolls like hose, making it extremely easy to install. And, since it will turn corners and go over or under obstructions, few joints are necessary. However, when a connection is used, the pipe is easy to cut and the insert-type fittings are quickly secured with stainless steel clamps. Ells, tees, couplings and reducers are available to suit any layout.

Manufactured from pure 100% "on grade" polyethylene raw material, NATIONAL Polyethylene Pipe is available in sizes from 1/2-inch to 6 inches in diameter, in a variety of wall thicknesses. For complete information on the use of NATIONAL Polyethylene Pipe, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

*Trademark

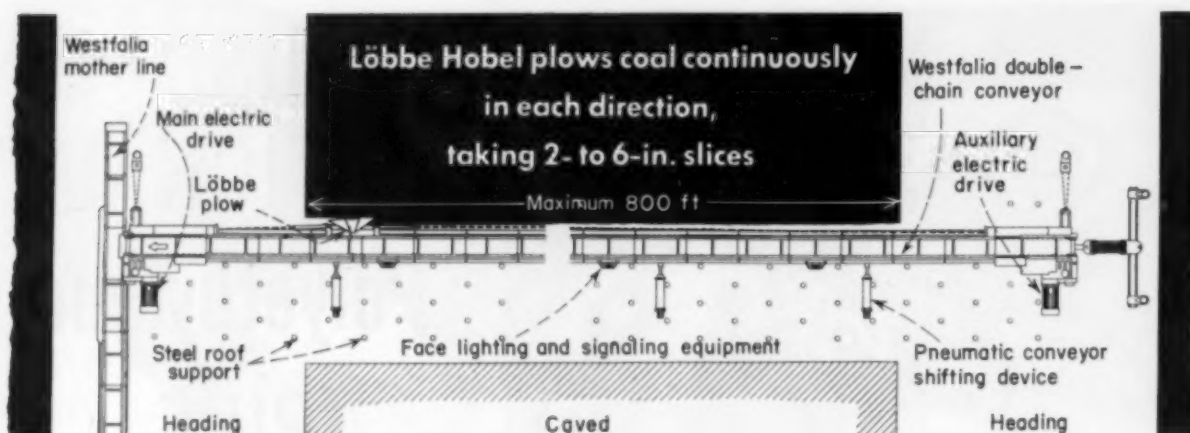
NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



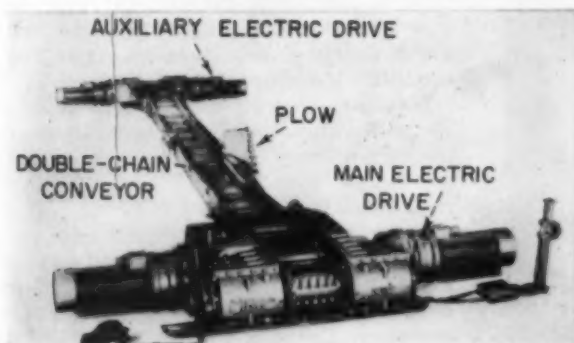
NATIONAL Polyethylene PIPE

UNITED STATES STEEL

Westfalia Lünen's Löbbbe Hobel...



The Original Truly Continuous Mining Machine

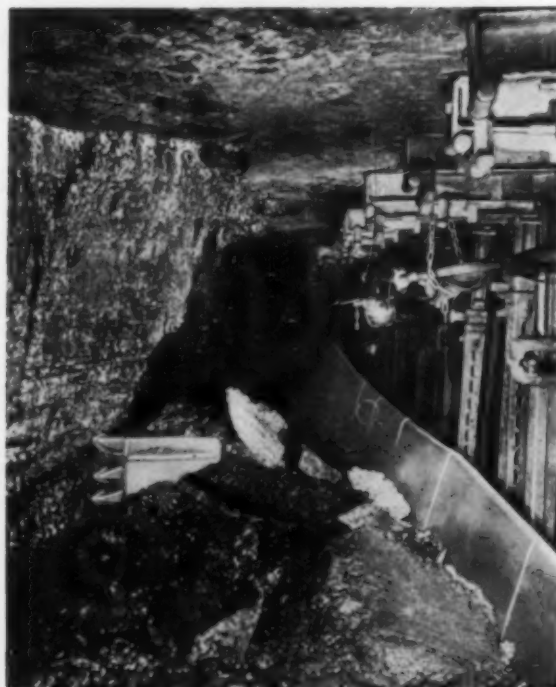


THE LÖBBE PLANER ...



... Operating in thin coal

Photo courtesy of U. S. Bureau of Mines



... Operating in thick coal

A LÖBBE HOBEL GIVES YOU ...

1. Higher overall coal recovery
2. Low maintenance cost
3. Remote-control operation
4. Easy supervision
5. Safe working area under steel roof support

For further information write to

MINING PROGRESS, INC.

Sole distributors for Westfalia Lünen
MAIN OFFICE, HIGHLAND MILLS, N. Y.



World
renowned
mining equipment

TO HELP YOU BLAST WITH GREATER ECONOMY

The **INSIDE STORY**

See how modern blasting methods
improve breakage

See how the point of initiation af-
fects rock movements...controlsthrow

See the difference between progres-
sive and alternate detonation

Don't miss this movie for men who use explosives in Quarries, Strippings and Construction!

Here is a motion picture that gives the facts on modern blasting techniques. It shows how you can save money through better, more complete fragmentation . . . how you can increase safety by eliminating the need for secondary blasting . . . and how your public relations can be improved by holding noise and vibration to a minimum.

"*The Inside Story*" is prepared by Atlas Powder Company as a technical service. Show it to your organization for a better understanding of scientific blasting. It explains in detail how the point of initiation affects blasting results . . . how millisecond delay techniques and alternate velocity loading are used to gain maximum efficiency.

This information also makes "*The Inside Story*" well suited for showing at institute meetings and to other engineering groups.

How to get the film. Simply write us on your letterhead, telling us at what type of meeting you'd like to show "*The Inside Story*," and approximately when you'll need it. We'll try to ship a print to you well in advance of the date you select.

Ask also about other Atlas educational material such as the films, "*How to Handle Women and Explosives*" (for your safety meetings), and "*We're Blasting Near You*" (to show to your neighbors). And write for "*Better Blasting*," the informative Atlas newsletter on latest blasting materials and methods.

EXPLOSIVES
DIVISION
ATLAS
POWDER COMPANY
WILMINGTON 99, DELAWARE
offices in principal cities

Ruggedness Built-in

makes the new...

HENDRIX MH

Heavy Duty Mining Bucket

Stand Out!



Rugged work requires rugged equipment and that's exactly the word for the Hendrix "MH"... RUGGED! The "MH" is specifically designed and built for greater productions at the lowest cost per yard in the toughest mining applications.

In sizes 4½ through 14 cubic yards—PERFORATED OR SOLID.

HENDRIX MANUFACTURING CO., Inc.
MANSFIELD, LOUISIANA



Why neoprene belting is best for the long haul

Mine operators in increasing numbers are recognizing the advantages of conveyor systems to help speed production. And more of these operators are specifying neoprene belting for long-term economy.

Why? The ability of a belt to stand the severity of mine service is all-important. Oil and grease, for example, deteriorate ordinary rubber belting but have no effect on neoprene. It's difficult to keep lubricants from getting on the belt—but if the belt has a neoprene cover, it won't soften and wear away. This

means long wear for the cover and continued protection for the fabric.

Neoprene also protects against the effect of acid water, eliminates fabric deterioration from mold and mildew. It has excellent resistance to abrasion. And, of course, neoprene is flame-resistant, offering greater safety underground.

25-year service records in many applications are not unusual for neoprene, and in coal mine conveyor service enviable records are right now being established. Ask your supplier for

neoprene the next time you need belting.

We would like to tell you more about neoprene and its many useful properties. A request will put your name on our mailing list for regular, free copies of the *Elastomers Notebook*. Just write to: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. CO-6, Wilmington 98, Del.



**Better Things for Better Living
...through Chemistry**

NO CONCRETE PIT!

Easiest to MOVE!



PORTABLE TRUCK SCALES

Engineered for rugged use in the field. Low initial cost, no maintenance. Can be used as PITLESS SCALE saves on pit costs.

CAPACITIES: 20 to 52 tons. DECK LENGTHS 18 to 43 ft.

OTHER THURMAN SCALES: Pit • Warehouse • Industrial • Liquid Weighing • Wheelbarrow • Batching • Automatic

Precision Scales since 1918



156 N. 5th St. Dept. CA-1 Columbus, Ohio

WHY I HAVE COAL AGE SENT TO MY HOME

By the President
Of an Important Kentucky Mining Company

"You won't find copies of COAL AGE among the papers and magazines on that table," the president of a major coal producer told us during a recent visit to his office.

"COAL AGE is one of only three magazines I have sent to my home. There I have time—without interruptions, or very few—to really cover each month's issue as it comes out.

"It's simply that I've got far too much reading and far too little time here in the office. For me, COAL AGE is must reading. I know of no better way of keeping up to date on the industry. So I get COAL AGE at home, to be sure I have time for it." If you're not seeing COAL AGE regularly or have to depend on an office-routed copy, why not take a tip from this top-flight mining executive and subscribe today. A year's trial subscription costs you only \$3—a mighty small investment for the 1,000 editorial pages of industry news, mine descriptions, operating, technological and equipment data you'll get. Of course, we'll send COAL AGE wherever it's best for you, home or office. Just fill out the form below and send it along.

COAL AGE, Subscriber Service,
330 West 42nd St., New York 36, N. Y.

Send me COAL AGE for 1 year at \$3 (U. S. and Canada only)

☐ Check enclosed ☐ Bill Company ☐ Bill me

Name Position

Address Home ☐

Business ☐

City Zone State

Mining Company

Mine Name

CA657 To Save Time, Please Fill Out Completely

Watch for Your 1957 Coal Age Mining Guidebook

A Regular Coal Age Subscriber Service . . . Coming in Mid-July

Whatever your job—deep, strip or auger mining, preparation, maintenance or safety—you'll find the 1957 COAL AGE Mining Guidebook and Buying Directory Issue a practical, useful working tool. It's the only comprehensive, one-volume guide to coal mining operation available today, revised and updated each year to keep you on top of the latest methods and equipment.

All in One Issue—For Year-Around Reference

- Equipment methods and results proven at hundreds of efficient mines
- Case-history solutions of major operating problems
- Trends in current mining practice
- Ideas and experience of thousands of successful operating men
- Condensed review of basic mining principles involved in every operation
- Special Buying Directory section listing manufacturers of over 1,300 products used in coal mining
- Manufacturers' product advertising, together with location of district sales offices and distributors for speedy service.

KEEP YOUR 1957 GUIDEBOOK HANDY . . . USE IT REGULARLY

"Nothing but... Manitowocs for Me!"

...says John DeRomo



Big, 6-yd. Manitowoc Model 4500 dragline removes approximately 4,000 yards of rocky overburden each 9-hour shift.

The John A. DeRomo Coal Company relies on Manitowoc excavators exclusively to load out more coal per shift from its Houtzdale, Pa. mine. "Nothing but Manitowocs for me!" is how owner John DeRomo puts it — after using only Manitowocs for 10 years.

Three Manitowoc Units

The big capacity champ in DeRomo's lineup of Manitowoc machines is a 6-yd. Model 4500 dragline with 120' of boom used for the heaviest stripping. Secondary stripping jobs are handled by a long-reach, 2½-yd. Model 3500 drag with 80' of boom. A husky 1¼-yd. Manitowoc 2000 shovel has the loading assignment.

Re-Worked Mine Pays Off

The cut pictured is 110' wide and has a 55' face with a 28" C seam of grade A bituminous coal. This seam produces an average 6,000 to 8,000 tons a month. Overburden is extremely rocky and hard-to-handle, but the 4500 dragline is removing about 4,000 yards per 9-hour shift.

John DeRomo is one of several operators to work over this area. Manitowoc capacity and efficiency help to make stripping of the heavy, rocky overburden a profitable operation. "We won't leave enough coal to keep a barbershop warm!" says DeRomo.

Exceptional Mobility

The ability of a machine to get around fast means a lot

to the overall profit picture on an operation of this type. DeRomo likes the mobility of his Manitowocs, pointing out that even the big 4500 dragline has traveled under low overhead obstacles without difficulty. And travel speed is fast and steady — even when climbing steep inclines.

Air Controls Speed Work

All of the DeRomo Manitowoc units have smooth-acting air controls. Operators stay at peak efficiency the entire shift — yet never lose the "feel" of manual control. Speaking of the smooth operation of his units, DeRomo says, "No strong arm is needed for my equipment . . . the 4500 drag rides like a baby carriage."

Call Your Distributor

See why prominent mining operators look to Manitowoc for top payload performance — call your distributor now for detailed facts on the complete line of Manitowoc mining machines.

Manitowoc Engineering Corp. Manitowoc, Wis.



For the big job ahead...

7,000 new coal hoppers coming to New York Central this year

to speed coal from mines to markets

Last year, the New York Central System ordered 11,250 new 70-ton coal hoppers, at a cost of \$82,555,500. Delivery on this purchase order has already commenced. Hoppers are running out of the car builder's shop in increasing numbers.

These new 70-ton hoppers on order added to the Central's and the P. & L.E.'s coal cars already

in service, brings the total of the New York Central System's coal fleet up to 41,764 cars.

As the delivery of the new coal hoppers on order gains momentum, more and more coal operators and coal users will benefit from New York Central's determination to speed deliveries from mine to market.

Route of the "EARLY BIRDS" the one-day faster freight service

New York Central Railroad

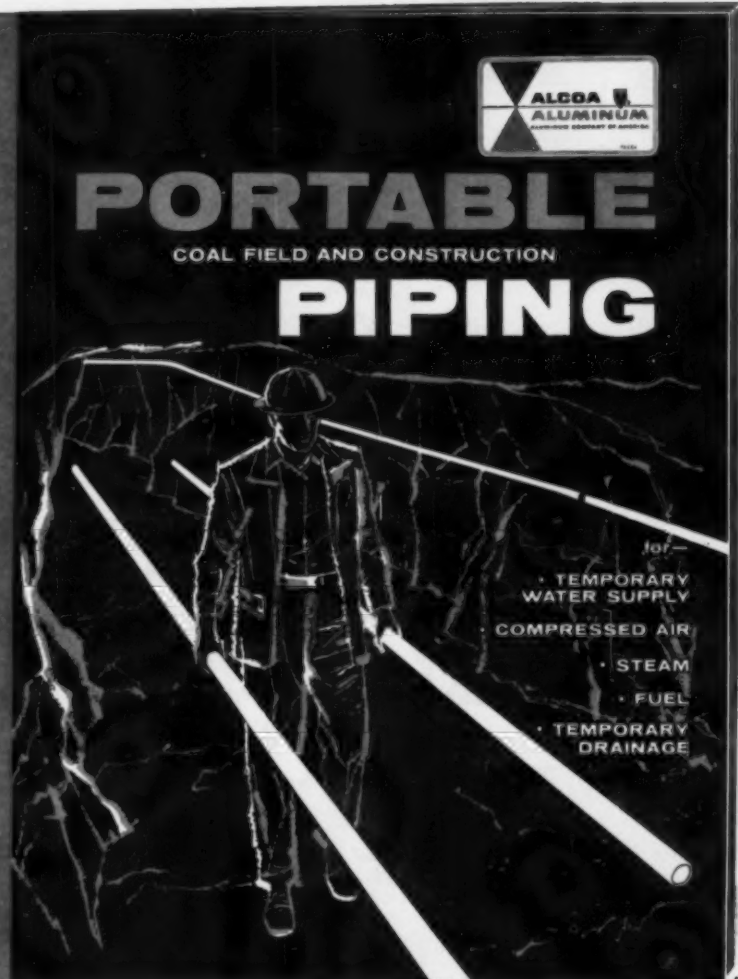
Save money with Portable Piping of Alcoa Aluminum...

learn how in this FREE BOOKLET!

.....▶
If portable piping presents a cost or service problem in your operations, look to aluminum for the solution. A new free booklet will give you all the facts about portable piping of Alcoa® Aluminum to handle temporary water supply, compressed air, steam, fuel, temporary drainage and other services.

Find out why Alcoa Aluminum Pipe permits low labor and handling costs when lines must be installed or moved quickly. Learn about the service economies made possible by the strength, durability and corrosion resistance of aluminum. Get complete data on sizes, performance, availability and sources of supply for pipe and quick couplers available for aluminum lines.

This free booklet gives all the facts to help you find a sound, low-cost aluminum answer to your portable piping problems. Get it now! Use the handy coupon.



Aluminum Company of America
924-F Alcoa Building
Pittsburgh 19, Pennsylvania

☐ Please send me your new literature describing portable piping of Alcoa Aluminum.

I need low cost, portable piping for the following services: _____

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____



BETTER FRAGMENTATION with Spencer Prilled Ammonium Nitrate now permits stripping units to move up to 25% more material. Read below why Spencer Prills are superior to other types of nitrate solids!

Cut Blasting Costs 50% with Spencer Prilled Ammonium Nitrate

Independent laboratory tests prove that porous structure of Spencer product develops more effective and higher speed blast.

Because ingredients cost less, and the mixing process is so much simpler, blasting costs can be cut up to 50% by using Spencer Prilled Ammonium Nitrate. At the same time, this product produces better fragmentation, yielding up to 25% more material.

The basic ingredient is Spencer Prilled Ammonium Nitrate. Impartial laboratory tests have now proved that the porous structure of these prills makes them the most effective and highest-speed blasting agent of any manufactured nitrate solid. This conclusion has been further verified by extensive field tests.

More even distribution made possible by the prills is one important

reason for the superiority of Spencer Prilled Ammonium Nitrate. And, since the deflagration of a solid explosive is layer by layer from the surface of the particle, the additional surface available on the prill speeds up decomposition.

Contrary to popular opinion, the lesser bulk density of prilled ammonium nitrate actually *increases* rather than decreases the energy of the explosion. This fact is verified, not only by such an authority as the *ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY*, but also by comparative field tests. And more intense explosion means better fragmentation.

Not explosive in its normal form, Spencer Prilled Ammonium Nitrate

can be handled safely, and because the mixing operation is so simple and safe, it can be done right at the mine location.

As supplier of the original nitrate used in the early stages of developing the Akremite Blasting Process, Spencer Chemical Company has been closely associated from the very beginning with this project to create less expensive blasting techniques.

For more specific information about low-cost blasting for coal, iron, limestone or construction, write to Spencer Chemical Company. We will be glad to supply you with any needed technical assistance or service.

SPENCER CHEMICAL COMPANY

610 Dwight Bldg. • Kansas City 5, Mo. BALTIMORE 1-6600



How a midwest steel producer **TRIPLED TRACTOR-SHOE LIFE**

It's "tough-going" in a slag pit! Heavy loads, the grinding impact of abrasive rock and metal, really put tractor shoes to the test. And that's exactly what this steel producer did.

Amsco® cast Manganese Steel Tractor Shoes were installed in place of rolled shoes. The result: *a 3-time increase in service life*. While rolled shoes had previously been replaced after one season's service, the Amsco pads lasted nearly 3½ years—a total of 3374 service hours.

Here's further proof that Amsco Manganese Steel—"the toughest steel known"—can save you money and replacement time wherever severe impact and abrasion are a problem. Call your nearest Amsco representative, or write us direct, for further information on Amsco Tractor Shoes.



Amsco Manganese Steel Tractor Shoes
In addition to excellent impact and abrasion resistance, Amsco Tractor Shoes have counter-sunk bolts. This means less wear on bolts, often saves bolt-replacement when changing pads.



AMSCO

American Manganese Steel Division • Chicago Heights, Ill.

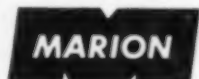
OTHER PLANTS IN: DENVER, LOS ANGELES, NEW CASTLE, DEL., OAKLAND, CAL., ST. LOUIS, JOLIETTE, QUEBEC



Companions in Coal Production

While a Marion 7800 walking dragline (background) strips overburden, its companion, a Marion 4161 shovel, loads coal at a vast bituminous stripping operation in southern Indiana. Overburden of clay and shale measures 40 to 85 feet in depth, and the coal seam averages six feet in depth. Swinging a 35-yard bucket on a 195-foot boom, the big walker moves an average of 550,000 yards per month. The electrically-powered loading shovel has a 7½-yard dipper.

CONSULT



MINING SPECIALISTS

for lowest costs on your property!



The smaller Marions handle big tonnages, too! At a Canadian ilmenite smelter, this 111-M clamshell uses a 3-yard bucket for ore and a 6-yard bucket for coal.

MARION POWER SHOVEL COMPANY—MARION, OHIO, U. S. A.

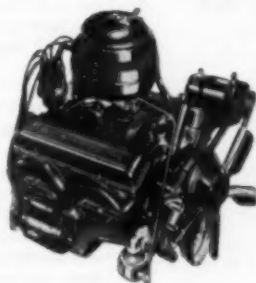


POWERFUL REASONS WHY A CHEVROLET STAYS ON THE JOB...SAVES ON THE JOB!

COMPACT CHEVY V8

(weighs up to 150 lbs. less than others)

- Shortest stroke of any truck V8
- Short, durable connecting rods
- Vertically compact cylinder block
- Rugged yet light crankshaft
- Efficient hydraulic valve lifters



- Long-wearing Moraine bearings

Chevrolet trucks are powered by V8's that make every ounce count. Because of their trimmed-down design, they use less power to haul their own weight and put more power into hustling your cargoes. Like all Chevrolet truck components, these engines are efficient performers—and that means top economy and dependability!

Chevy's the dollar saver *de luxe* of the American road, and many of the reasons why can be found beneath the Chevrolet truck hood. That's where you'll often find a great V8 that's at the head of its class for compact, *efficient* short-stroke design. You won't find features to equal all those listed here (at left) in any other truck V8's today. Or, if you prefer a 6, Chevy's got the most popular 6-cylinder powerplants in the history of hauling. They're honest-to-goodness truck engines, specially built to *stay* and *save* on rough, tough hauling jobs.

You'll find that a Chevrolet truck gives you *so much* to save with! Your Chevrolet dealer is waiting to fill you in on all the facts. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Biggest sellers . . . because they're biggest savers!

CHEVROLET

CHEVROLET TASK-FORCE 57 TRUCKS

PROFESSIONAL SERVICES

NEWELL G. ALFORD Consulting Mining Engineer

Coal Property Prospecting
Development, Operation and
Valuation

Oliver Building Pittsburgh 22, Pa.

ALLEN & GARCIA COMPANY

42 Years' Service to the
Coal and Salt Industries and Consultants
Construction Engineers and Managers
Authoritative Reports and Appraisals
335 S. Michigan Ave., Chicago
120 Wall Street, New York City

AMERICAN AIR SURVEYS, INC.

Registered Engineers
TOPOGRAPHIC MAPS FOR MINING
AERIAL PHOTOGRAPHS
907 Penn Ave., Pittsburgh 22, Pa.
Phone EXpress 1-3989

GEO. S. BATON & COMPANY

"Founded 1909"
Consulting Engineers
Cost Analysis — Valuations
Mine and Preparation Plant Designs
1100 Union Trust Building Pittsburgh 19, Pa.

JOHN J. BORDERS

Mine Roof Support Consultants
Construction Co.
Roof Bolting — Time Study
Modern Production Methods Analysis
Concrete Construction & Design
Foreign and Domestic
Pana, Illinois

EAVENSON, AUCHMUTY & GREENWALD

Mining Engineers
COAL OPERATION CONSULTANTS
VALUATIONS

2720 Koppers Bldg. Pittsburgh 19, Pa.

THERON G. GEROW

Mining Consultant and Engineer

111 North Wabash Avenue Chicago 2, Illinois

HOFFMAN BROS. DRILLING CO. Drill Contractors Since 1902

Specialists in exploratory—grout hole and pressure
grouting. Rigs located in over 50 strategic areas for
prompt service. Free estimates.

104 Cedar St. Pottsville, Pa.

HURLEY & ZELLER Mining Consultants

Industrial Engineering Programs Established
Methods Analysis—Foreman Training—Cost Control
1934 Sunshine Ave. 2800 Hart Street
Johnstown, Pa. Charleston, W. Va.

KIRK & COWIN

Ralph E. Kirk Percy G. Cowin
Registered Professional Engineers
Consulting—Reports—Appraisals
Mechanical Mining of Ore & Coal
Management and Construction of Mines
1—18th St., SW—Birmingham, Ala.
Phone 24-5566

HERBERT S. LITTLEWOOD

Consulting Electrical Engineer

Evergreen Hills Irwin, R.D. #2, Penna.

J. B. MORROW

Coal Consultant

Oliver Building Pittsburgh, Pa.

K. PRINS AND ASSOCIATES

Engineers and Consultants
Coal Preparation—Layouts
and Construction Designs
Wellston, Ohio phones 4-3335-4-2993

DAVIS READ

Consulting Engineer

Layout — Operation
Modern Production Methods
Plant Design — Preparation

120 S. La Salle St. Chicago 2, Ill.

ROBINSON & ROBINSON

Consulting Engineers

Mine Operation — Preparation
Coal Property Valuation
Industrial Engineering

Union Bldg. Charleston, W. Va.

J. PIERRE VOGEL

Coal Property Investigation
Coal Preparation

Oliver Building Pittsburgh, Pa.

J. W. WOOMER & ASSOCIATES

Consulting Mining Engineers

Modern Mines Systems and Designs
Foreign and Domestic Mining Reports
Oliver Building—Mellon Square Pittsburgh, Penna.

PAUL WEIR COMPANY

Established 1816

Mining Engineers & Geologists

DESIGN AND CONSTRUCTION

20 North Wacker Drive Chicago 6, Illinois



he's working
for you

THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers — and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.



McGraw-Hill PUBLICATIONS

Replies (Box No.): Address for office nearest you
 % This publication Classified Adv. Div.
 NEW YORK: P. O. Box 12 (36)
 CHICAGO: 520 N. Michigan Ave. (11)
 SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

Electrical-Mechanical Engineer—Large anthracite coal mining operation northeastern Pennsylvania, to take responsible charge design, construction and maintenance. Mining experience desirable but not required. Submit qualifications, experience, personal status and salary expected. P-4886, Coal Age.

Mechanical Engineer: Exceptional opportunity and pay for man under 35 with experience in mining or material handling field. Small company offers very interesting work in design and application of semi-automatic machinery. The W. W. Stamler Corp., Paris, Kentucky.

BUSINESS OPPORTUNITIES

Private Capital Available for production financing, expansion programs. Purchase of going operations considered. Inquiries confidential. BO-4260, Coal Age.

STRIP COAL WANTED

Lease or purchase—large or small tracts. Morgan Coal Company, 2850 North Meridian Street, Indianapolis 8, Indiana.

Proven COST REDUCTION PROGRAMS

for the Coal Industry

HELMICK & ASSOCIATES

9619 LAKE SHORE BLVD. CLEVELAND, OHIO

FOR SALE

- 2—Bucyrus Erie 54-B, Diesel Powered Combination High Lift 2 C.Y. Shovel 100 ft. Crane-Drillage Boom and One 30 ft. jib. Ser. Nos. 41559 and 37279. Recently overhauled in excellent condition.
- 1—Lima 1201, High Lift Shovel Boom 42 ft. and 2 1/2 C.Y. Bucket.
- 7—Caterpillar D-8 Tractors-Bulldozers, Serial Nos. 2U1789, 2U1692, 8R9223SP, 8R7785P, 8R7765P, 8R7755P & 1H6738.

PERINI CORPORATION

Framingham, Mass.
 Tel. TRINITY 3-7445

FOR SALE

- 1—12 BU Joy Loading Machine in excellent condition. Overall height 29".

Phone No.: 953X Bailey Coal Co.
 Phone No.: 857X R#1 Pomeroy, Ohio

FOR SALE

36-Type MM78-A
 JEFFREY MOLEYEYORS

Will sell single or in a group
 Freebrook Corporation L. M. Bartoe
 Keystone Building Kittanning, Pa.
 Phone 43-2311

GET CASH NOW

for your new surplus
 motors, controls and
 transformers!

NEW MOTORS AVAILABLE:

Over 5,000 new motors, in stock, from 1/4 HP to 200 HP.
 Special low prices.

Write, wire or phone collect!

AJAX ELECTRIC MOTOR CORP.

P.O. Box 262, Rochester, N.Y.
 Long Distance Phone LD. 132



WHAT'S LEFT IS RIGHT

THE service LEFT in used equipment must be priced RIGHT, or an equipment dealer finds himself out of step with his customers in no time at all. Our business has marched along briskly for years and we're convinced that our customers know we price fairly.

WE OWN WHAT WE ADVERTISE

Buy from the largest stock of good mining equipment in America. Includes all types of Joy Loaders, Shuttle Cars, Cat Trucks, Cutting Machines, Locomotives, Belt Conveyors, Chain Conveyors, Substations, etc.

JOY EQUIPMENT—REBUILT

- 1—Joy 20BU Loader, latest type.
- 2—Joy 14BU Loaders, low pedestal, 7AE.
- 2—Joy 14BU Loaders, medium pedestal, 7 RBE.
- 1—Joy 14BU Loader, high pedestal.
- 2—Joy 12BU Loaders, 9E, latest type.
- 2—Joy 11BU Loaders.
- 1—Joy 11BU Loader, latest type.
- 2—Joy 8BU Loaders, 250 volt DC.
- 1—Joy BU Loader, 34" overall height.
- 2—Joy 8BU Loaders, 220 volt AC.
- 2—Joy curved bar heads, complete.
- 1—Goodman 950 Loader on cats, excellent.
- 1—Joy 680 Shuttle Car, rebuilt.
- 1—Joy 580 Shuttle Car, rebuilt.
- 2—Joy 32E9 Shuttle Cars.
- 2—Joy 32E10 Shuttle Cars, rebuilt.
- 2—Joy 32E15 Shuttle Cars, rebuilt.
- 2—Joy 32E16 Shuttle Cars, rebuilt.
- 2—Joy T-1 Standard Cat Trucks, 220 AC.
- 1—Joy T-1 Standard Cat Truck, 250 DC.
- 1—Joy 381 Baby Machine, 250 volt AC.
- 4—Joy 118 Cutting Machines, like new.
- 1—Joy 78 Cutting Machine, like new.
- 3—Goodman 512 Machines with Bugbusters.
- 1—Goodman Machine on Cats, 31" high. All hydraulic.
- 1—Goodman 512 Cutting Machine, perfect.
- 2—Goodman 512 Cutting Machines, 220 volt AC.
- 1—Jeffrey 29UR Cutting Machine, Universal Head, cuts anywhere in seam, 36" hi on rubber tires. Perfect.
- 1—Lee Nersa low vein Machine Carriers.

LOCOMOTIVES

- 2—Jeffrey MH-2154's, 15 tons, perfect, 42" Ga.
- 4—Jeffrey, 13 ton, type MH-110, 36", 42" and 44" Ga.
- 3—Jeffrey, 10 ton, type MH-78, 42" and 48" Ga.
- 12—Jeffrey, 8 ton, type MH-58, 42", 44" and 48" Ga.
- 2—Jeffrey, 8 ton, type MH-100, armor plate frames.
- 2—Jeffrey, 6 ton, type 2186, 22" above rail perfect.
- 3—Jeffrey, 4 ton, type 825 Locomotives, 22" high.
- 10—G. E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
- 1—G. E. 8 ton, type 822 Locomotive, 44" Ga.
- 3—G. E. 10 ton, type 889 Locomotives, 42", 44" and 48" Ga.
- 1—Goodman, 4 ton, 8-30 Locomotive, 22" above rail.
- 2—Goodman, 6 ton, Locomotive, 26" high.
- 2—Goodman type 33, 6 ton, 44" and 48" Ga.
- 3—Goodman 8 ton, type 32A, 38", 44" and 48" Ga.
- 2—Westinghouse type 902, 4 ton, 42" and 48" Ga.
- 2—Westinghouse, type 904, 6 ton, 44" and 48" Ga.
- 2—Westinghouse, type 906, 44" and 48" Ga.
- 2—Westinghouse, type 907, 10 ton, 44" and 48" Ga.

TIPPLE EQUIPMENT

- 1—Cedar Rapids portable sizer screening Plant.
- 1—Allis-Chalmers 5' x 14" Rineff Vibrator.
- 1—5 x 14 Robbins double deck Vibrator.
- 1—4' x 10' Robbins Gyrex Vibrator.
- 1—McNally Pittsburgh all steel Tipples, three track, perfect.

Feeders, Drag Conveyors and Loading Booms.

CUTTING MACHINES

- 1—Jeffrey 29 UR Universal on rubber.
- 1—Goodman 512-G-3, 220 AC.
- 1—Goodman on rails, 31" overall height.
- 1—Baby Goodman 212, rebuilt.
- 2—Goodman 312, 18" high.
- 2—Goodman 512's with Bugbusters, like new.
- 10—Goodman 512, Rebuilt or as removed from Service.
- 2—Joy 581 Baby Machines, 250 Volt DC.
- 1—Joy 581 Baby Machine, 220 volt AC.
- 2—Goodman 512 Cutting Machines, 220 volt AC.
- 2—Goodman 12AA's and 112AA's.
- 2—Goodman 324 Slabbers.
- 2—Goodman 724 Slabbers.
- 15—Jeffrey 351's, like new, 17" high.
- 2—Jeffrey 351's, on low vein trucks.

IF YOU DON'T CONTACT US BEFORE YOU TRADE—WE BOTH LOSE MONEY.

Send us your inquiries

Thousands of other items.

J. T. FISH

Phone 2825

Logan, W. Va.

- 15—Jeffrey 35B's and 35BB's.
- 2—Jeffrey 29B's on truck.
- 2—Jeffrey 29C's, truck mounted.
- 1—Jeffrey 29L on truck, perfect.
- 2—Sullivan CR-10's, 13" high.

LOADING MACHINES

- 17—Joy Loaders, all types.
- 2—Jeffrey 61 CLR's on rubber, 26".
- 3—Jeffrey L-300 Loaders.
- 2—Myers Whaley No. 3 Automat Loaders.
- 2—Clarkson Loaders, 26" above rail.

CONVEYORS

- 1—Robins 30" conveyor, 1000'.
- 2—30" Belt Conveyors, 10 to 15 H. P.
- 3—600' Conveyor Belt 30".
- 2—61WH 15" Ram Conveyors, 300 ft.
- 2—181W Elimating Conveyors.
- 4—Joy Ladel UN-17 Shakers.
- 16—Goodman G-12's and G-15 Shakers.
- 3—Long 400 DBH 13" Chain Conveyors, 25 H. P. Motor—new.

CONVERTERS AND DIESEL PLANTS

- 1—50KW, G. E. TC-6, 275 volt, Rotary Converter.
- 3—100KW, G. E. TCC-6's, 275 volt, Rotary Converters.
- 1—150KW G. E. HCC-6, 275 volt Rotary Converter.
- 1—150KW, 6 phase, Allis-Chalmers Rotary Converter, 275 volt DC, perfect.
- 1—200KW, G. E. HCC-6 Rotary Converter, 275 volt DC.
- 3—300KW G. E. HCC-6 Rotary Converters, 275 DC.
- 1—200KW Westinghouse Rotary Converter, 275 DC.
- 1—200 KW Allis-Chalmers Rotary Converter, 6 phase 275 DC, perfect (all the above with 6900/13000 and/or 2350/4000 primary transformers).
- 1—62KW MG Set, General Electric, 275 DC volt, 220 volt AC.
- 2—150 KW MG Set, General Electric and Westinghouse.
- 1—200KW MG Set, Westinghouse, rebuilt.
- 2—150KW, Allis Chalmers MG Set, 275 DC volt, excellent, 220/440 volt AC.
- 1—300KW Westinghouse, 600 volt, MG Set, rebuilt.
- 1—500KW Westinghouse, 275 volt, MG Set, perfect.
- 1—Cummins 125KW Diesel with 250 volt DC Generator.
- 1—700 H. P. Shaft Hoist, complete.

Complete steam plant, will sell all or any part. Boilers, like new, 1100 H. P. and 500 H. P. Also transformers, turbines, etc.

Complete Tipples with Cleaning Plants.

MISCELLANEOUS

- 16—Air Compressors, 1 H. P. to 40 H. P.
- 49 Mine Pumps, all types.
- 2—Barber Greene self propelled Bucket Elevators.
- Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
- 45 Mine Cars, drop bottom, 42" Ga.
- 30 Mine Cars, Drop Bottom, 44" Ga.
- 50 Mine Cars, 48" Ga., Drop Bottom, 20" above rail.
- 180 Mine Cars, 18" high, end dump, 44" Ga.
- 90 Mine Cars, end dump, 20" high, 48" Ga.
- 15—Brown Fabyre HXL and HGL Car Spotters.
- 1—12 ton Differential Gate Lorry.
- Incline Hoists, 25 to 50 H. P.
- 1—Jeffrey 6 ft. Aerodyne Fan.
- 2—Storage Tanks, 10,000 gallons.
- 1—Storage Tank, 8,000 gallon.
- 2—Storage Tanks, 4,000 gallon.
- Five Gallon G. I. Cans.
- 400 tons Rails, 25 to 60".
- 10 tons Copper Trolley and Feeder.
- 300 Transformers from 1 to 2,000 KVA, 110 to 13,000 primary volts.
- 400 Electric Motors, 5 to 250 H. P.

Huge stock of Mine Supplies.

LOCOMOTIVES

STORAGE BATTERY—TROLLEY
 THE IRONTON ENGINE COMPANY
 FARMINGDALE, NEW JERSEY
 (Formerly Ironton, Ohio, 1902-1958)

New — RAILS — Relaying

All sections available together with all accessories. Also Spikes, Bolts, Cars & Locomotives. Always in Market to Buy Relay Rail

M. K. FRANK

400 Lexington Ave.,
 Park Bldg.,
 New York, New York
 Reno, Nevada
 Carnegie, Pa.

GOOD USED COAL STRIPPING EQUIPMENT

5480 Marion Electric 15 yd. Shovel
1600 P&H Electric 6 yd. Shovel
4500 Manitowoc 5 yd. H.L. Shovel
88-B Bucyrus Erie 4 yd. Shovel-Drag
1601 Lima 4 yd. Standard Shovel
120-B Bucyrus Erie 4 yd. Electric Shovel
1201 Lima 3 1/2 yd. Standard Shovel
1055 P&H 3 1/2 yd. Standard Shovel
111-M Marion 3 yd. H. L. Shovel
1201 Lima 2 1/2 yd. H. L. Shovel
955 P&H 2 1/2 yd. Standard Shovel
3500 Manitowoc 2 yd. H. L. Shovel
Unit 1020 3/4 yd. Shovel
625 Page Diesel Drag, 160', 9 yd.
6160 Monaghan Drag, 160', 8 yd.
625 Page Diesel Drag, 150', 10 yd.
4500 Manitowoc Drag, 140', 4 1/2 yd.
621-S Page Diesel Drag, 135', 6 yd.
7-W Monaghan Elec. Drag, 120', 7 yd.
618 Page Diesel Drag, 120', 5 yd.
5-W Bucyrus Monaghan Drag, 120', 5 yd.
2400 Lima Dragline, 130', 5 yd.
111-M Marion Diesel Drag, 80', 5 yd.
1055 P&H Dragline, 80', 3 1/2 yd.
1201 Lima Dragline, 85', 3 yd.
955 P&H Dragline, 90', 2 1/2 yd.
604 & 802 Lima Cranes
1201 Lima Comb. Shovel & Crane
51-B Bucyrus Erie Shovel & Drag
38-B Bucyrus Erie Shovel & Backhoe
600 Reich Heavy Truck Mounted Rotary Air Drills
McCarthy Coal Auger Drill
Compton Coal Auger
Mayhew Rotary Truck Mounted Air Drills
Portadrill Truck Mounted Air Drills
Euclid Trucks—Bottom & Rear Dumps
Bay City, Lorain, P&H, Northwest & Osgood Truck Cranes
Caterpillar, International & Allis-Chalmers Bulldozers

FRANK SWABB EQUIPMENT CO., INC.

313 Hazleton Nat'l Bank Bldg.
Hazleton, Pa. Gladstone 5-3658

FOR SALE

17 Yd. Garwood scoop with power take off for HD-19 or HD-20 tractor, 2 extra tires, 18 x 2400. Price \$4,000. Good Condition.

1 Sullivan Core drill, independent engine drive, engine new. Mounted on new Dodge tandem truck. 100 ft. "A" rod and core barrel, 100 ft. of "N" rod and core barrel. Price \$10,000. Good condition. Can be seen at Winters and Evans, R.D. #2, Portersville, Pa., Phone Portersville 2094.

NEW and REBUILT STORAGE BATTERY LOCOMOTIVES

1 1/2 to 10 Tons 18" to 36 1/2" Track Gauge.
GREENSBURG MACHINE CO.
Greensburg, Pa.

COAL CRUSHERS

- 1—24" x 24" Jeffrey Single Roll
- 1—30" x 30" Jeffrey Single Roll

COAL CUTTERS

- 5—Goodman type 112 shortwall, A.C.
- 1—Sullivan type 7B super-shortwall, A.C.
- 3—Sullivan type 7B super-shortwall, D.C.
- 6—Sullivan type CE-7, A.C.
- 1—Jeffrey type 28-A, A.C.

SHAKER CONVEYORS

- 7—Goodman type G-20
- 6—Goodman type G-15
- 1—Joy type UH-17
- 4—Vulcan type 25/30

CHAIN CONVEYORS

- 1—Jeffrey 61-HG face conveyor
- 1—Jeffrey 61-W room conveyor
- 1—Jeffrey 61-EW elevating conveyor

PICKING TABLES

- 1—30" x 41'6" Card pan conveyor loading boom, two sections
- 1—48" x 51' Card pan conveyor loading boom, two sections

BATTERY LOCOMOTIVES

- 3—3 1/2-4 ton Mancha, 24" ga.
- 1—4 ton Westinghouse, 24" ga.
- 1—4 ton Ironton 36" ga.
- 2—6 ton General Electric, 36" ga.
- 2—7 ton General Electric, 36" ga.
- 1—7 ton Atlas—36" ga.
- 3—8 ton Ironton, 36" ga.
- 2—8 ton General Electric, 36" ga.
- 2—8 ton Goodman, 36" ga.
- 4—10 ton Atlas, 36" ga.

TROLLEY LOCOMOTIVES

- 2—10 T. Jeffrey, 42" ga.
- 1—13 T. Goodman, 42" ga.
- 1—13 Jeffrey, 42" ga.
- 1—15 T. Jeffrey, 42" ga.

SHUTTLE CARS

- 1—Joy model 60D3P, battery operated
- 7—Joy model 60D1, battery operated

MINE FANS

- 1—120" Joy La-Dei axial flow fan, model L-14
- 1—7" Jeffrey aerodyne 2 stage fan

SINCE 1898 DEALERS IN DEPENDABLE
RECONDITIONED MINING MACHINERY
OF ALL TYPES

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd., Denver, Colorado

20# — 30# — 40#
NEW RAIL IN STOCK
LEFTON INDUSTRIAL CORP.
Genl. Office: 212 Victor St.
St. Louis 4, Mo.

- 1—28-U Jeffrey cutting machine, 230-V, DC, track mounted, late type, exell. cond. Ser. 527181.
- 2—WK-38 Sullivan air compressors, 110-CFM, track mounted, complete with 230-V, DC, permissible motors and controls.
- 1—Ingersoll-Rand stationary air compressor, 300-CFM, complete with 100-HP, 3-ph. motor, receiver, and oil controls.
- 1—Universal stone crusher, size 1020, 40-HP motor, Acme Industrial Equipment Inc.

PO Box 1107, Morgantown, W. Va. Phone 5764

FOR SALE

- 1—100 Ton Platform Scale
- 1—50 TWP Copy Coal Washer
- 2—4' x 6' Jeffrey Traylor Vibrators

Priced very reasonable.
S. B. McCLUNG, INC.
Williamson, W. Va.



MOTORS • GENERATORS
TRANSFORMERS
WORLD'S LARGEST INVENTORY
NEW • REBUILT
ELECTRIC EQUIPMENT CO.
Phone Station Collect GL 3-9783
P. O. Box 51
Rochester, New York

SAVE MONEY! UNUSED

6X6 ARMY TRUCKS

2 1/2-ton GMC & International



- From Government Storage!
- Unused and Guaranteed!
- Factory New Condition!
- Reconditioned Trucks also Available!

Save up to \$3,000 on one of our unused Army trucks. See for yourself how TWO of our trucks cost you even LESS than one new truck.

Compare our Tandem Axle Trucks with front wheel drive, 10 forward speeds, overdrive and new mud and snow tires with similar equipment elsewhere.

Investigate now! . . . There's no obligation . . . and we deliver on approval!

For Specifications, Prices, Delivery Write,
Wire or Phone Collect—Jackson 5-7841
MILTON Y. TOOMBS, JR.
Sales Manager

MEMPHIS EQUIPMENT
CONSTRUCTION AND AUTOMOTIVE
EQUIPMENT AND PARTS
766 SO. THIRD ST. MEMPHIS, TENNESSEE

PAGE DRAGLINE FOR SALE
MODEL 625, 10 CU. YD. BUCKET, 150 FT. BOOM
Priced Right
WIDNOON COMPANY
L. M. Bartoe
Keystone Building, Kittanning, Penna.
Phone 43-2311

*If there is anything
you want . . .*

that other readers
of this paper
can supply

*or—something
you don't want*

that other readers
can use,
advertise it in the

SEARCHLIGHT SECTION

MINING MACHINERY FOR SALE

TRACKLESS EQUIPMENT

- (C) 2-14BU Joy Loaders
(C&W) 4-12BU Joy Loaders
(C) 1-11BU Joy Loader-Rebuilt
(C) 1-8BU 500 Volt DC
(C&W) 2-8BU 250 Volt DC
(W) 2-Myers Whalley, #3, Track Mounted
(W) 1-58C Joy Shuttle Car, Rebuilt
(C) 2-65C Joy Shuttle Cars
(C) 3-100C Joy Shuttle Cars
(C) 2-32D Joy Shuttle Cars
(W) 2-32E7 Joy Shuttle Cars
(W) 2-32E10 Joy Shuttle Cars—Rebuilt
(C) 1-Low Horse Shuttle Car
(C) 1-20U Jeffrey, Rubber Mtd.
(C) 4-PL11 Joy Elevators
(W) 4-40 H. P. Asme Self Propelled Air Compressors Permissible

CONVEYORS

- (W) 1-Harbor Green belt conveyor, 2600' center to center, 36" wide, Mtd. on 10' channel iron in 30' sections. Framing is bolted and may be dismantled with little difficulty. Was used only a very short time & is in extremely good condition. We are offering this equipment at a bargain price and will be happy to submit further details along with firm quotation.
(W) 2000' 30" Conveyor Belting, Good Condition
(C&W) 4-26" Hewitt-Robbins & Joy Belt conveyors—complete
(W) 2-35A Goodman, 34" approx. 500'
(C&W) 15-61AM, 61EW, 61HG & 61W Jeffrey chain conveyors
(W) 4-15" Joy Chain Conveyors Permissible
(C) 2-30" Joy Chain Conveyors
(C&W) 6-012V, 613 & 638 Goodman Shakers—AC & DC
(W) 1-PT12 Long Piggyback Conv.
(W) 1-PT15 Long Piggyback Conv.
(W) 33-Goodman Power Dunkbills, Model 477, 61V
(W) 7-UN17 LaDal Shaker Conv.

- (C) 1-600' Jeffrey Button Rope Conveyor
(W) 1-230', 40" Seraper Conv.
(W) 7-Tippie Belts: 20", 24", 30", 36", & 48"—any length
(W) 1-45' Conveyer, Bucket Elevator, 6"x5"x-5 1/2" Buckets
(W) 1-33' Drag Conv., 10" wide
(W) 1-48' Seraper 24"x36" Flights
(W) 1-56' Seraper 30"x36" Flights
(W) 1-84' Flight Conveyor 22"x2 1/2" Flights
(W) 1-98' Drag Conveyor 30"x36" Flights
(W) 1-51' Drag Conveyor 24"x36" Flights
(W) 1-30' Drag Conveyor 11"x1 1/2" Flights
(W) 2-42"x35" Loading Booms
(C) 1-42"x32" Loading Boom
(C) 1-48" Loading Boom

CUTTING MACHINES

- (C&W) 4-7AU Track Mtd. Sullivans
(W) 4-7B Sullivans
(W) 10-11B Sullivans, 35x50 H. P.
(C) 1-1253 Goodman 220/440V
(C&W) 10-12AB & 12AA Standard Goodmans
(W) 2-12AA Goodmans
(W) 2-212AA Baby Goodmans
(C) 1-2123 Baby Goodman 220/440 Volt
(W) 1-31263, 220/440 Volt AC Rebuilt
(C) 2-412 CA Goodmans
(W) 6-312 Goodmans
(C) 2-212 Goodmans
(C) 1-824 Goodman, 42" T. G.
(C) 1-1224 Goodman, Rubber Mtd.
(W) 1-29C Jeffrey Art Wall
(C) 1-29U Jeffrey 220/440 volt 42" T. G.—Excellent
(C&W) 25-35B & 35BB Jeffreys, As is or rebuilt, w/Stub Axle trucks
(C) 1-35L Jeffrey
(C) 1-Lot Machine Trucks for Jeffrey & Goodman

LOCOMOTIVES

- (W) 1-4 Ton Ironton, 42" T. G., 25' high
(W) 1-4 ton, 4-36 Goodman, 36" T.G., 25' hi.
(W) 2-4 Ton Goodman, 36" T. G.

- (C) 2-4 ton MH96 Jeffreys
(C) 1-4 ton MH12 Jeffrey
(W) 1-6 ton MH150 Jeffrey, Rebuilt, 42" T. G., 25' High
(W) 14-6 Ton MH88 Jeffreys, 42" & 44" T. G.
(W) 5-6 Ton HM 603 G. E., 36", 42" or 44" T. G.
(W) 5-6 Ton HM823 G.E., 42" or 48" T. G.
(W) 4-6 Ton HM835 G. E.
(W) 1-6 Ton G.E. Battery, All New
(C&W) 3-6 Ton, 3314T Goodmans, 36" & 48" T.G.
(C&W) 2-4 Ton, 304 Westinghouse
(C&W) 4-6 Ton MH100 Jeffreys, 36" & 42" T. G.
(W) 4-6 Ton HM819 G. E., 48" T. G.
(W) 1-8 Ton Goodman, 36" T. G.
(W) 2-10 Ton HM75, 44" T. G.
(C) 1-10 Ton West., 48" T. G.
(C) 1-13 Ton Jeffrey MH110, 42" T. G.
(W) 1-Lot Trucks, Gears & Armatures for most of these locomotives.

MINE CARS

- (W) 51-36" T. G. Drop Bottoms
(W) 109-36" T. G. Rotary Dumps 42" High
(C) 16-42" T. G. End Dumps
(W) 230-42" T. G. End Dumps Various Sizes
(W) 33-44" T. G. Drop Bottoms, 10 Ton
(W) 206-44" T. G. Drop Bottoms, Various Sizes
(W) 385-44" T. G. End Dumps, Various makes & sizes
(W) 355-48" T. G. S. D., Drop Bottoms
(W) 50-48" T. G. Rotary Dumps 9 Ton
(C) 150-48" T. G. Rotary Dumps

SUBSTATIONS

- (C) 1-100KW G. E. Motor Generator Set
(W) 1-150KW Rotary, 2300/4000 Automatic
(W) 1-150KW West. MG Set, 1200 RPM, 2200 V., 275 DC
(C) 1-150KW West. MG Set 200 V.
(W) 1-150KW G.E. MG Set, 1200 RPM, 2200 V., 275 DC
(C) 1-200 KW HCCB, GE Rotary, 2300/-4000 V., 275 DC
(W) 1-150KW HCCB, GE Rotary, 2300/4000
(W) 1-150KW Rotary Armature
(W) 1-200KW Rotary Armature

ELECTRIC AND MACHINE SUPPLY COMPANY
MINING AND INDUSTRIAL EQUIPMENT

WE ARE ALWAYS IN THE MARKET FOR GOOD USED EQUIPMENT

Call, Write or Wire Us, Day or Night

Whitesburg, Kentucky—P. O. Box 610—Phone 2223

Teletype #367

* (W) Denotes Equipment Located at Whitesburg, Kentucky

BILL CONLEY

Clarksburg, West Virginia—P. O. Box 227, Ph. Main 3-0253

Teletype #CB 59

* (C) Denotes Equipment Located at Clarksburg, West Va.

MELVIN ADAMS

H. J. (HANK) UBBING

Please Direct Your Inquiries To Proper Location For Prompt Quotation—All Inquiries Appreciated

Save on Your INDUSTRIAL TRACK

FOSTER QUALITY

RELAYING RAILS

Handle more cars better—cost less to install and maintain. Foster stocks all Rail Sections 12" thru 175", Switch Material and Track Accessories.

SEND FOR CATALOGS

RAILS • TRACK EQUIPMENT • PIPE • PILING

LB FOSTER CO.

PITTSBURGH 20 • NEW YORK 7 • CHICAGO 4
ATLANTA 8 • HOUSTON 2 • LOS ANGELES 5

New and Used Mining Equipment
Crushers, feeders, conveyors, tipples, locomotives, mining machines & fans.

The Industrial Machine & Electric Company
T. E. Davies, Owner
PO Box 1107, Morgantown, W. Va.
Phone 5764

RAILS

MIDWEST STEEL CORP.
550 DRYDEN ST., CHARLESTON, W. VA.

RAVEN MINING EQUIPMENT COMPANY
GOOD USED EQUIPMENT — PRICED RIGHTYou can be sure of a "Fair Deal" or "No Deal" at "RAMECO"
See Raleigh Turner, Mr. Chafin, Uncle "Milt" or Charlie

- 2-572 Coal Drills—D. C.
3-571 Coal Drills—D. C.
2-612V Shaker Conveyors—Size 1 Pan
2-Vulcan Shaker Conveyors—Size 6 Pans
2-61-AM Chain Conveyors—5' Pan
2-Face Conveyors
Roberts & Schaefer Super-Air-Flow Table, complete with Dust Collector
1 Phillips Cross-over dump for mine cars
1 Mine Car Scale with Stroeter-Ames Recording Device
1 De-Watering—3 Classifying Screens
Retractors for Locomotives
5 Edison Lamp Chargers, Lamps, Electric Still
1 Electric Mine Car Greaser
1 4000 Storage Tank
1 20 ton Truck Scale—Platform 9 by 20
Shop Equipment—Drill Press, Grinders, Air Compressor, Chain hoists
Electric Drills—Anvils—Vise
1-907 White 10 Ton Locomotive
1-32-1-4T Goodman 5 Ton Locomotive
1-30-B Goodman 5 Ton Locomotive—Clutch Reel
1-602 White in Jeffrey 121 frame—R-SE Reel—28" high

- 3-MH Jeff 96 Locomotives
1-MH Jeff 88 Locomotive
2-35B—1-35B Machines
1-35-L—1 CR-10 Machines
1-212-AA—1 312 Machine
1 Buddy Sullivan—DC with truck
Trucks and pony trucks for 212-AA and Standard Goodmans
100 Mine Cars—23" above rail—End Dump
1-6 Fan with AC or DC motor
2 Sullivan hoists—100' Per Minute
35± rail & switches—48" Gauge Ties for 25± rail—Frogs, Points, Plates
3 Sub Stations—Complete with Transformers
1 Rubber-tired locomotive with 5 by 7 car Locomotive tires—extra armatures—supplies & parts—New & Used
Link-Belt Tipples—Shaker—Feeder—Booms—Car Retarders—Elevators—Conveyors—Slate Picking Lights—6000 Gallon Tank—Motors AC & DC—Face Jacks—Brown Fays Blowers—Treated Power Poles, Cross Arms and Fittings
1 Double Track Steel Bridge—235' Long—55' High

We will save you money—Come to see us—Highway 460—N&W Railway—Airport at Doran, Virginia—Train—Fly—Thanks.
C. T. Adair, Mail Raven, Virginia — Telephone, Richlands, Va. Day 5505 Night 5521—TRANSFORMERS—
BOUGHT AND SOLD

We carry a large stock of rebuilt and guaranteed transformers, and invite your inquiries.

Custom-built transformers and coils manufactured to your specifications.

Expert Repair Service—all makes and sizes of transformers rewound, repaired and redesigned. Ask for our price schedule.

THE ELECTRIC SERVICE CO., INC.

5322 Hetzel St.

Cincinnati 27, Ohio

40 Years' Dependable Service

—ADVERTISERS IN THIS ISSUE—

*Indicates more product information may be found in company advertising appearing in COAL AGE 1956 Mid-July Mining Guidebook and Buying Directory Issue. Check your Guidebook index.

*Aerquip Corp.	136	H & L Tooth Co.	131	Salem Tool Co.	33
*Allegheny-Ludlum Steel Corp.	16	*Harnischfeger Corp.	34-35	Searchlight Section	198-201
Allis Co., Louis.	161	*Hendrick Manufacturing Co.	192	Simplex Wire & Cable Co.	27
*Allis-Chalmers General Products Div.	105	Hendrix Manufacturing Co., Inc.	172	Snap-On Tools Corp.	134
Allis-Chalmers Construction Machinery Div.	10, 141, 151	*Hewitt-Robins Inc.	160	Spencer Chemical Co.	198
Aluminum Co. of America	197	Heyl & Patterson Inc.	36	*Stamler Corp., W. R.	126
*ACF Industries Inc., American Car & Foundry Co.	Third Cover	Hough Co., Frank G.	50-51	Standard Oil Co. of Indiana	42
American Manganese Steel Div.		Hulbert Oil & Grease Co.	2-3	Stoody Co.	112-113
American Brake Shoe Co.	199	International Harvester Co. (Construction Equipment Div.)	46-47	Sun Oil Co.	Insert between pp. 36-37
*American Mine Door Co.	122	International Harvester Co. (Drott Manufacturing Co.)	48-49	Sutphen, Peter	170
*American Pulverizer Co.	138	Jeffrey Manufacturing Co.	156-157, 178	*Tennessee Coal & Iron Div.	18-19, 111
*American Steel & Wire Div.	18-19, 111	*Jones & Laughlin Steel Corp.	123	*Texas Co.	8-9
Armstrong-Bray & Co.	180	*Joy Manufacturing Co.	30-31	Thurman Machine Co.	194
Atlas Powder Co.	191	*Kennametal Inc.	106-107	United States Rubber Co. Mechanical Goods Div.	109
Austin Powder Co.	130	Kensington Steel Co.	139	*United States Steel Corp.	18-19, 111, 189
*Baldwin-Lima-Hamilton Construction Equipment Div.	183	Koehring Co.	22-23	*United States Steel Export Co.	18-19, 111, 189
Bethlehem Steel Co.	24, 147, 159, 179	Lee-Norse Co.	25	Warn Manufacturing Co.	172
Bird Machine Company	4	*LeRoi Div. Westinghouse Air Brake Co.	145	*Western Machinery Co.	160
Boston Woven Hose & Rubber Co.	133	Leman Machine Co.	188	*Westinghouse Electric Co.	154-155
Broderick & Bascom Rope Co.	140	*LeTourneau-Westinghouse Co.	37, 39	Wickwire Spencer Steel Div.	
Bucyrus-Erie Co.	14-15	Link-Belt Co.	Fourth Cover, 129	Colorado Fuel & Iron Corp.	163, 207
Caterpillar Tractor Co.	28-29, 208	Long Co.	21	PROFESSIONAL SERVICES	202
Chevrolet Div. General Motors	201	Lukens Steel Co.	32	CLASSIFIED ADVERTISING F. J. Eberle, Business Mgr.	
Chicago Pneumatic Tool Co.	115	Macwhyte Co.	143	EMPLOYMENT OPPORTUNITIES	203
*Cincinnati Mine Machinery Co.	173	*Manitowoc Engineering Co.	195	SPECIAL SERVICES	203
Cities Service Oil Co.	117	Marion Power Shovel Co.	200	EQUIPMENT (Used or Surplus New)	
Clark Equipment Co.	164-165	*McNally Pittsburgh Manufacturing Co.	Insert between pp. 20-21, 128	For Sale	203-205
Coal Age	194	Metallurgical Products Dept. of General Electric Co.	176-177	WANTED Equipment	203
Colorado Fuel & Iron Corp.	163, 203	*Mine Safety Appliances Co.	Second Cover		
Columbia-Geneva Steel Div.	18-19, 111	Mining Progress Inc.	190		
*Compton Inc.	185	National Mine Service Co.	137		
*Construction Equipment Div. Baldwin-Lima-Hamilton Corp.	183	National Tube Div.	18-19, 111, 189		
Continental Gin Co.	124	New York Central System	196		
Deister Concentrator Co.	120	Ohio Brass Co.	101		
*Denver Equipment Co.	168	Okonite Co.	169		
Dorr-Oliver Inc.	43	*Paris Manufacturing Co.	162		
Drott Mfg. Co.	48-49	Post-Glover Electric Co.	132		
duPont de Nemours & Co., E. I. (Elastomers Div.)	193	Porter Company Inc., H. K., Quaker Rubber Div.	152		
Eaton Manufacturing Co.	127	West Virginia Wks. Connors Steel Div.	153		
Ensign-Bickford Co.	52	Republic Steel Corp.	40-41, 174-175		
Eso Standard Oil Co.	121	Rockbestos Products Corp.	45		
Euclid Div. General Motors Corp.	44	Roebling Sons Corp., John A.	119		
Fairbanks, Morse & Co.	149	*Rome Cable Corp.	103		
Fairmont Machinery Co.	38	Ryerson & Son Inc., Joseph T.	6		
*Falk Corp.	171				
Firth Sterling Inc.	135				
Fletcher & Co., J. H.	26				
Flexible Steel Lacing Co.	170				
General Electric Co.	20, 166-167				
General Electric Co. (Construction Materials Div.)	181				
Goodman Manufacturing Co.	17				
Goodrich Industrial Products Co., B. F.	1				
Goodyear Tire & Rubber Co.	13				
*Gundlach Machine Co., T. J.	125				
Guyana Machinery Co.	180				

ADVERTISING SALES STAFF

Atlanta 3...M. H. Miller, 1201 Rhodes-
Haverty Bldg., Jackson 3-6951

Chicago 11...G. A. Mack, P. W. Roets, 520
N. Michigan Ave., Mohawk 4-5800

Cleveland 15...J. E. Lange, 1510 Hanna
Bldg., Superior 1-7000

Dallas 1...C. L. Jones, Jr., 1712 Commerce
St., Riverside 7-5117

Los Angeles 17...J. B. Uphoff, 1125 W. 6th
St., Madison 6-9351

New York 36...H. C. Chellon, G. P. Latjén
500 5th Ave., Oxford 5-3959

Pittsburgh 22...Wm. H. Glinder, 1111
Oliver Bldg., Atlantic 1-4707

Philadelphia 3...J. B. Lewis, Architects
Bldg., 17th & Sansom Sts., Rittenhouse
6-0079

St. Louis 8...F. W. Roets, Continental
Bldg. 2615 Olive St., Jefferson 5-4867

San Francisco 4...J. W. Ottersen, 68 Post
St., Douglas 2-4600

London EC 4, England...H. Eagler, McGraw-
Hill Co. Ltd., 95 Farringdon St.



In carrier landings, planes coming in at more than 100 knots are stopped in a split second. This amazing performance is made possible by having each plane hook onto one of several wire ropes stretched across the flight deck. Both plane and rope receive an almost unbelievable shock at the moment of contact. Needless to say, only top-quality wire ropes can be used for this application because . . .

you can't bargain with safety

While your use of wire rope differs from this carrier application, *safety should be just as important to you*. For, although a "bargain" rope may save you money, it can cost you your peace of mind. So don't bargain with safety. Buy a rope that's a *quality* rope—buy Wickwire Rope.

5049



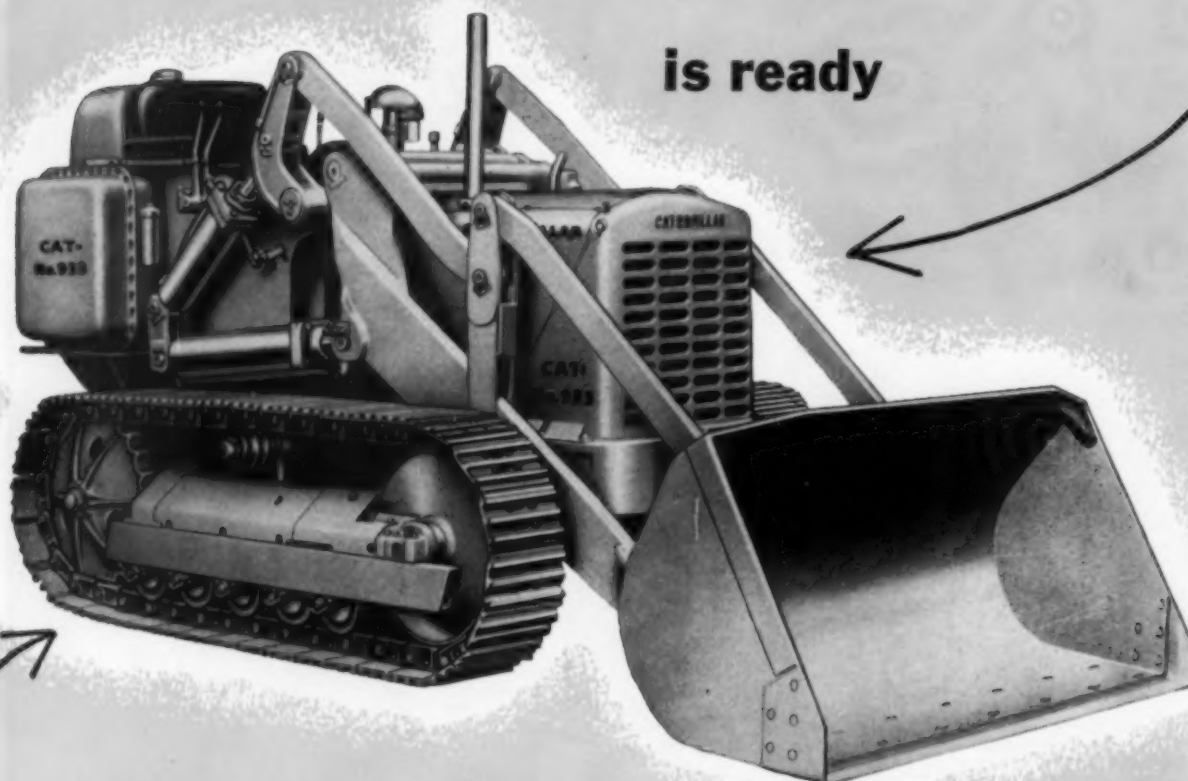
**LOOK FOR THE
YELLOW TRIANGLE**

**PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION**

THE COLORADO FUEL AND IRON CORPORATION—Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New Orleans
New York • Philadelphia

ANNOUNCEMENT! The new, improved

No. 933 (Series E) TRAXCAVATOR*



is ready

with longer life, lower maintenance!

Looks a lot like the popular No. 933 you already know—but there's greater stability, performance and durability built into this new Series E!

Now the rugged CAT* No. 933 Traxcavator includes a new heavy-duty undercarriage with:

- New Rugged Track Roller Frame
- New Solid Sprockets
- New Heavier Idlers
- New Tough Track Rollers

The complete line of Cat-built Traxcavators

	No. 977	No. 955	New No. 933 (Series E)
Flywheel HP at sea level	100	70	50
Bucket capacity, cu. yd.	2¼	1½	1
Bucket tip-back at ground level	40°	40°	40°
Bucket tip-back at maximum lift	46½°	47½°	48°
Dumping height (center of hinge pin to ground)	141¼"	128"	119½"

The easy operation, the great capacity and the dependable power—these features remain as outstanding as before.

For complete details on this *tough* new Traxcavator, call your Caterpillar Dealer. He'll be glad to give you full information on the complete line of Cat-built Traxcavators. He's the man to remember, too, for expert service and for replacement parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

**ONE GOAL: To concentrate
our capabilities, resources and
experience on the design,
manufacture, distribution and service
of job-tested heavy equipment.**

Does a trip of Mine Cars ever wear out?



No! Effectively, a mine car trip *never* wears out. When one car needs repairs, you simply shunt it to a siding in a couple of seconds...and the rest of the cars keep rolling out the tonnage. When you retire a car after a long, hard life, it's just one car, not a major over-haul. One car at a time over the years, a mine car trip is kept young and productive with ordinary maintenance and repair.

And **Q C F** Constant Haulage Mine Car Systems offer additional advantages. *Flexibility:* extending or changing your line is relatively simple when there's only track to move. *Two-way payloads:* men and supplies can ride into your mine in cars that carry the coal out.

Actual cost and production figures, supplied by mine operators, show the many advantages of **Q C F** Constant Haulage Mine Cars. Ask your **Q C F** Representative. Just write, wire, or phone any **Q C F** office.

AMERICAN CAR AND FOUNDRY DIVISION

Q C F Industries, Incorporated. Sales Offices: New York—Chicago—St. Louis—Cleveland—Washington—Philadelphia—Berwick—Huntington—San Francisco. Plants: Berwick, Pa.—Huntington, W. Va.

acf

MINE CARS

for Constant Haulage

From a single
Link-Belt contract to a
complete, modern plant . . .

THE CLINCHFIELD STORY

PART II
of a three part series

Safe, uniform, gentle drying

*Efficient system built around Multi-Louvre dryers
produces highly marketable coal at low cost per ton*

LIKE every phase of the Clinchfield (Va.) Coal Company plant's operation, the drying system is a model of handling and processing efficiency. Thorough, accurate moisture reduction—resulting in a uniform, high-grade metallurgical coal—is accomplished with Link-Belt Multi-Louvre dryers.

These dryers utilize *controlled low temperatures* and air velocities for safe, uniform drying . . . prevent oxidation. Product size is closely maintained—thanks to gentle handling which minimizes dust and degradation.

Whether it's a dryer, a conveyor or an entire plant that you need—Link-Belt will furnish it, install it, stand behind it. For details, phone your Link-Belt office.

14,500

LINK-BELT

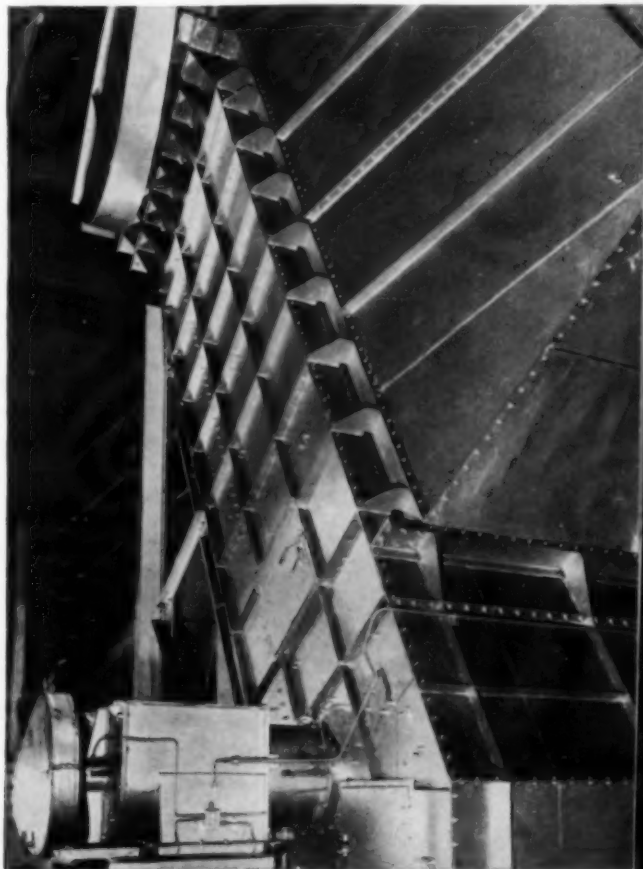
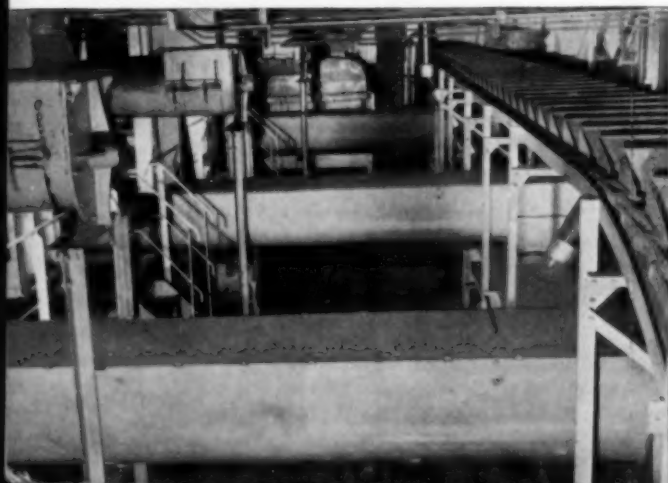
COAL PREPARATION AND HANDLING MACHINERY

LINK-BELT COMPANY: Chicago 9, Birmingham 3, Cleveland 15, Denver 2, Detroit 4, Huntington 9, W. Va., Indianapolis 6, Kansas City 8, Mo., Louisville 2, Pittsburgh 13, Seattle 4, St. Louis 1, Scarboro (Toronto 13), Springs (South Africa).



CLEAN COAL DRAG TANK CONVEYOR — 12 ft. wide — handles 175 tph of ¼" to 100-mesh coal from drag tank for delivery to centrifugal dryers. Conveyor chain speed is 15 f.p.m.

THREE 18-IN. DIA. SCREW CONVEYORS at discharge end of dryers deliver dried coal to flight conveyor at right for discharge to railroad cars.



MULTI-LOUVRE DRYER — one of three — receives wet coal delivered from surge bins by sectional flight screw feeders. Speed of feeder can be varied to suit requirements.

CENTRAL CONTROL PANEL at top provides push-button regulation over all handling equipment. Lower control panel serves the three Link-Belt Multi-Louvre dryers.

